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To consider and take action upon all general questions relating to the navigation and carrying business of the Great Lakes, maintain necessary shipping offices and in general to protect the common interest of Lake Carriers, and improve the character of the service rendered to the public.

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FREE REPORTING PRIVILEGES.

The Weather Bureau has made arrangements to give vessel owners the free use of the telephone lines to Thunder Bay Island, Lake Huron. Those wishing to avail themselves of the privileges must communicate their wishes to the chief signal officer at Detroit, who will thereupon instruct the observer at Alpena to obtain all information and render any assistance possible regarding the vessels of the applicant. It is only necessary for owners to once have their addresses registered at Alpena. They are then at liberty to apply to the observer at that place at any time.

ELECTRIC LIGHTING CHANNELS.

Capt. W. S. Schley, U. S. N., and Lieutenant Commander C. H. West, U. S. N., of the Light-House Establishment, recently visited Mobile, Ala., to consider a plan for electrically lighting twenty-five miles of the dredged channel through Mobile Bay by submarine cables. The channel, although permitting vessels of twenty feet draft to pass from Mobile to the Gulf of Mexico, is at present insufficiently lighted for night navigation.

IRON ORE PRODUCTION.

Reports received at the geological survey from twenty three states and two territories give a total production of 11,507,607 long tons of iron ore in 1893. This amount is smaller than that recorded for any year since 1887, and is a decrease of almost 29 per cent. over 1892. No increase is evident in any of the states producing over 100,000 tons of iron ore, except in Minnesota, where, owing to the development of the Mesaba range and the completion of transportations facilities, the output increased about 250,000 tons, and in Colorado, where, owing to the production of larger amounts of pig iron locally, about 30,000 tons more in iron were required than were consumed in 1892. The proportionate decline of iron ore production during the year was greatest in Michigan, Wisconsin, Pennsylvania and New York.

NEW TONNAGE.

The lake built vessels to which official numbers were assigned by the Bureau of Navigation, Treasury Department, during the week ended April 21 are as follows: Steam vessels: Harvey H. Brown, Detroit, Mich., built at Wyandotte; net tonnage, 1,874; gross tonnage, 2,674 tons. B. Campbell, Grand Haven, Mich., built at Charlevoix; gross tonnage, 59. Myrtie, Buffalo, N. Y.; 25 tons gross.

MEASURING A MILLIONTH OF A DEGREE.

Professor Langley, of the Smithsonian Institution, has brought his bolometer to a state of high perfection. This instrument is a fine wire through which a current of electricity is kept flowing. The resistance of the wire varies with the temperature, and hence the strength of the current also varies. By measuring the current, therefore, the temperature of the wire can be ascertained. In the latest and most delicate form the wire is 1-500 inch wide and 1-5000 inch thick, and a difference of temperature amounting to 1-1,000,000 degree centigrade can be perceived.

TO FIND THE ANGLE OF HEEL.

For many years the Bureau of Navigation, and afterward the Bureau of Equipment, have been in search of an efficient and simple instrument for accurately showing the roll and heel of a ship in a sea way. The pendulums and other devices have not come up to the requirements, and lately the Department has been experimenting with several of the so-called "liquid clinometers," or substitutes for the pendulum. Thus far the question seems almost as far from solution as ever, but American ingenuity will, it is hoped, eventually surmount the problems and give the navy an instrument capable of filling the bill.

SUBMARINE PHOTOGRAPHY.

The art of photographing objects under water is one of the latest achievements of science. For years the leading photographers of this country and Europe have been endeavoring to perfect some contrivance which would enable them to take photographs, instantaneous and otherwise, in any depth of water. For some time the art of photographing in calm weather at a depth of from fiften to twenty feet has been successfully practiced, but some better plan was desired, especially by the scientific photographers. This "long felt want" has been supplied by Prof. Louis Boutan, of Paris. His apparatus consists of a magnesium lamp and an oxygen cask. The cask is filled with oxygen just before being lowered, the lamp hanging by a special attachment at the top of the vessel. A receptacle containing magnesium in powder is connected with the lamp in such a manner that the powder can be thrown across the alcoholic flame by an automatic bellows. Some of Boutan's photographs which were takes at a depth of 5,000 feet with this apparatus have been shown. They are of course wholly without a background, a defect however which photographers say can be easily remedied.

LLOYD'S REGISTER SHIPBUILDING RETURNS.

FOR THE QUARTER ENDED 31ST MARCH, 1894.

From the returns compiled by Lloyd's Register of Shipping, it appears that, excluding war ships, there were 414 vessels of 725,208 tons gross under construction in the United Kingdom at the close of the quarter ended 31st March, 1894. The particulars of the vessels in question are as follows, similar details being given for the corresponding period in 1893, for the purpose of comparison:

DESCRIPTION.	31st Mar., 1894		31st Mar. 1893	
	No.	Gross Ton.	No.	Gross Ton.
STEAM.				
Steel	316	658,601	236	531,444
Iron	25	3,857	20	3,469
Composite and Wood	5	938	7	378
Total	346	663,396	263	535,291
SAIL.				
Steel	32	58,132	51	82,525
Iron	3	645	2	465
Composite and Wood	33	3,035	38	3,387
Total	68	61,812	91	86,377
Total Steam and Sail	414	725,208	354	621,668

The present returns of steamers under construction exceed those of the previous quarter by about 85,000 tons, and are the largest received since March, 1891. On the other hand, the returns of sailing vessels are slightly lower than last quarter's, and are the smallest since September, 1888.

Of the tonnage under construction in the United Kingdom at the end of March, excluding that being built for foreign and colonial owners, over 92 per cent. was under the supervision of the surveyors of Lloyd's Register with a view to classification by that society. Of the total vessels under construction in the United Kingdom, 357 of 645,548 tons (or approaching 90 per cent. of the tonnage) were under the society's supervision. In addition to the foregoing, 15 vessels of 25,925 tons are reported as building abroad with a view to classification in Lloyd's Register Book. The returns of vessels "preparing" (*i. e.*, ordered but not commenced), exceed those for the previous quarter by 95,000 tons, and are, especially as regards steamers, exceptionally high. So large a steam tonnage has, in fact, not been reported since the 31st of December, 1889.

OWNERSHIP OF VESSELS UNDER CONSTRUCTION. (WARSHIPS EXCLUDED.)

The following list apportions the vessels now under construction in the United Kingdom to the countries for which they are being built: United Kingdom, 298; 574, 167 tons. British Colonies, 5; 3,000 tons. Austria, 2; 2,640 tons. Bulgaria, 2; 2,110 tons. China, 1; 2,500 tons. Denmark, 1; 2,500 tons. Egypt, 1; 550 tons. France, 6; 5,420 tons. Germany, 8; 20,669 tons. Greece, 1; 125 tons. Holland, 4; 11,730 tons. Italy, 1, 3,060 tons. Japan, 1; 3,090 tons. Norway, 5; 12,520 tons. Russia, 16; 14,182 tons. South America, 1; 2,400 tons. Spain, 1; 1,745 tons. Turkey, 2; 488 tons. United States of America, 1; 514 tons. For sale or nationality of owners not stated, 57; 61,698 tons. Total, 414; 725,208 gross tons.

WORK IN HAND IN PRINCIPAL DISTRICTS.

Clyde, 130; Tyne, 70; Middlsboro' and Stockton, 70; Wear, 47; Mersey, 5; Hartlepool and Whitby, 19; Belfast and Londonderry, 14; Total number, 355 vessels, having a gross tonnage of 670,203.

There are also building 49 warships, having a total displacement of 122,865 tons, not including a recent order for eleven torpedo boat destroyers placed with several shipbuilding firms. Four war vessels of 9,370 tons displacement are also building for foreign account and for sale.

NEWS AROUND THE LAKES.

CHICAGO, ILL.

Special Correspondence to The Marine Record.

The steamers Italia and Caledonia arrived here last week with flaxseed from Washburn, Wis.

Capt. Richard Armstrong is here from Bay City getting his steamers Sailor Boy and Post Boy ready for the excursion business.

Capt. Dick Davis had his excursion steamers Claribel and Josie Davison running excursions on Lake Michigan Sunday, the day being very fine he did a thriving business.

The whaleback passenger steamer Christopher Columbus will come back to Chicago this season and run in the excursion business between Chicago, Milwaukee, St. Joseph and Michigan City.

The schooner Cora A, Capt. A. Petterson, arrived here Sunday afternoon with lumber from Tawas. She left here April 8th with corn for Port Huron. She was the first schooner through the Straits this season and the first to arrive at Port Huron with grain.

The Chicago Fire Proof Covering Co. have completed covering the boilers of the steamer Arthur Orr. They have also covered the boiler on the barge Peshtigo, the excellent results of the covering they placed on the boiler of the steamer A. D. Hayard, last season having recommended them to the owners of the Peshtigo.

Work on the new dry dock weich is being built by the Chicago Ship Building Co., on the Calumet river at South Chicago is being rapidly pushed forward. The cofferdam has been placed in position and the work of pumping is in progress. It is intended to have the dock completed by October next. The dock will be of sufficient length to admit vessels with 425 feet keel.

George Cooper, single, aged 42 years, a lineman on the tug E. P. Ferry, dropped dead on South Water street Monday morning. He was a member of the Chicago Firemen's & Linemen's Association. The members of that association took charge of his remains which they will bury Wednesday at Calvary Cemetery. Troy, N. Y., papers please copy.

Four of the Lake Michigan and Lake Superior Transportation Co's steamers are in commission. The Jay Gould and City of Duluth left for Lake Superior April 21st, the City of Traverse April 25th, and the Peerless April 28th. During the season the Peerless and City of Duluth will leave Chicago Wednesday evening alternately, and the City of Traverse and Jay Gould Saturday evenings alternately.

Capt. E. J. Buscey has been appointed master of Michael Cudahy's new steam yacht Catherine C., built by the Davis Boat and Oar Co., Detroit. Her dimensions are 118 feet over all, 17 feet beam, 8 feet 6 inches depth of hold. Engine triple expansion 12 and 18 and 30 by 16, wheel 6 feet diameter, 9 feet pitch. Captain Buscey left here Tuesday for Detroit to bring the Catherine C to Chicago.

Capt. Charles A. Richardson, the newly appointed inspector of hulls for Chicago District, took the oath of office and had his bonds presented and approved by the Hon. Martin J. Russell, collector of customs on Monday. Capt. Richardson was born in Oswego, N. Y., and has sailed on the lakes since boyhood. He has had charge of steamboats for the last twenty years and is well known among the sailing fraternity. His appointment gives general satisfaction. Capt. Richardson has sold his ownership in his patent rudder holder and support to F. W. Chittenden, 53 River street, Chicago, his former partner in the vessel agency business.

Wednesday afternoon J. H. Randall & Son, yacht builders, launched a handsome steam yacht which they named the Contest. Her dimensions are 60 feet in length, 10 feet beam, 4½ feet depth of hold. High pressure engine 8 by 8, built by Carl Anderson. Scotch type boiler 4½ by 7 feet, to be allowed 150 pounds steam pressure, built by Johnston Bros., and a "Trout" wheel 4 feet diameter, 6 feet 6 inches lead. The new yacht has very fine lines and should attain great speed. Her pilot house and cabin will be of cypress, all panel work, with hardwood finish.

P. H. Fleming chartered the steamer Raleigh and consort Tokio for corn to Port Huron at 1 cent; the steamer City of Berlin for 150,000 bushels of oats to Buffalo at 1¼ cents. C. W. Elphicke & Co. chartered the steamer —— to load oats at Milwaukee for Port Huron at 1¼ cents. Capt. John Priadiville chartered the steamer Britannic for wheat to Ogdensburg at 3¼ cents; the steamers Oscar T. Flint and consort Genoa for wheat to Kingston at 3 cents free of canal tolls; the barges Fred Carney and Isaac Stephenson for Ogdensburg for wheat at 3¼ cents. The steamer McVittie will tow the Stephenson and Carney to Ogdensburg. J. J. Rardon & Co. chartered the steamer Aurora and Italia for corn to Port Huron at 1¼ cents. J. G. Keith & Co. chartered the steamer Yakima for 87,000 bushels of wheat to Buffalo at 1½ cents. The steamer City of Samoa was chartered for corn to Kingston at 3 cents free.

CLEVELAND, O.

Special Correspondence to The Marine Record.

The large steamer S. S. Curry got enough coal here on Wednesday to carry her to Mullen's coal docks, at Amherstburg, where she will receive a further supply.

Mr. Ford Trist, formerly draughtsman with the Polsom Iron Works Co., Owen Sound, Ont., has engaged in a similar position with the Cleveland Ship-Building Co.

Mr. Mullen, of the fueling firm of Mullen & Gatfield, visited Cleveland this week and says his firm has about 4,500 tons of coal, which they will supply to their patrons at former prices.

The law firm of Gary & Pinney, 722-722 Perry-Payne building, has been changed through Capt. M. B. Garry retiring. The business will be conducted as formerly by Orestes C. Pinney, Esq.

The steamer Specular, Capt. Rattray, got away Wednesday night after waiting since Friday last for fuel. The Curry came here from Buffalo, but only got a car load of coal and left for Lake Superior.

Rev. J. D. Jones, chaplain of the "Floating Bethel," is in San Jose, Cal., and he is heard from preaching in the Florence night mission rooms, "down the alley," and holding forth in his usual whole souled style of oratory.

Mr. George Elsey has been appointed manager of the new tug line at this port with offices at Main street bridge. Mr. Elsey has an extensive acquaintance among vessel men, is well liked and is the right man in the right place.

Managers of the passenger line boats out of this port express no anxiety about the fueling outlook, as they have closed season contracts. Nothing is said, however, about the other fellow, who can't deliver what may be nonprocurable.

The municipality is now trying to learn who owns the lake front. The city vainly imagines that its title is clear, but the Lake Shore railroad is in possession, hence, the tenth part of the law, or the right to hold possession is being questioned.

The death of Oscar Townsend this week is greatly regretted among the older school of vessel men. It is permitted to but few men to take their departure, leaving so bright and honorable a record as the late Mr. Townsend earned in his business career.

The strike of miners on the Mesaba range has changed the trading of the Menominee Line boats for the time being, and the Norman, Briton and the Grecian, under a charter for Mesaba ore, have been ordered to Ashland for Norrie ore at 75 cents.

The Cleveland & Buffalo Transit Co. have made a passenger rate of $2.50 for their daily service between the two ports. The steamers leave this port every evening (except Sunday) at 6:15 and arrive in Buffalo at 7:30 a. m. Sunday trips will be resumed on June 1.

The Smith Co. tug L. P. Smith, was successfully launched on Saturday, from the Globe yards. Her dimensions are 80 feet long, 18 feet beam and 12 feet deep. This is the first of the fleet of three steel tugboats recently contracted for L. P. & J. A. Smith, of this port.

The large tug Harrow is being fitted up by E. R. Edson so as to carry a limited number of passengers between this port and Rond Eau, Canada, and to act as a dispatch boat for the fishing tugs working in mid-lake throughout the season. The Harrow will no doubt receive a fair patronage when it becomes known that so pleasant an excursion may be taken at a moderate cost.

The master of the steamer Neosho states that his recent grounding in the "Soo" River was caused by the wheel chains parting. A master was recently exonerated from all blame in a collision case through the parting of his wheel chains when it was proved that the vessel was fitted with the best material and that it was well looked after, although a mechanical defect no doubt existed prior to the casualty.

Chartering has simmered down to little or nothing and the scarcity of fuel is now beginning to be felt, the miners' strike having already lasted nearly two weeks. 75 to 80 cents on ore from Lake Superior is not a paying freight, nor is the Duluth rate from 2 to 2¼ cents on wheat anything to leave a margin, consequently chartering is duller now than it has been since the season opened.

DETROIT, MICH.

Special Correspondence to The Marine Record.

Detroit Graphite Manufacturing Co. have a contract for painting the iron work of four of the largest buildings in the city, including the Chamber of Commerce building, with their L. S. G. paint.

Vessel men have become alarmed about the fuel supply on Detroit river being nearly exhausted. The Mullen & Gatfield Co. has 4,500 tons and Smith a fair stock on hand yet.

The steamer Wilhelm stopped on her way up Detroit river on Monday and was bonded in the suit of the owner of the schooner Midnight, which boat was lost while in tow of the Wilhelm four years ago.

No improvement appears in the fuel question. The supply on hand here is virtually exhausted and dealers say they don't know when to expect shipments from the mines. If vessel grates would only burn hard coal a number would be fueled with it without delay.

Articles of incorporation have been filed by the Wyandotte Boat Co., who will continue the buisness of the Davis Boat and Oar Co., at Wyandotte. The incorporators are Charles M. Woodruff, Henry M. Ferry, Fred. B. Harper and John H. Smedley. The capital stock is $40,000. Operations will be begun at an early date and increased as the business warrants.

Beeson's "Inland Marine Directory" for 1894, is issued in a larger and more complete form than ever before. In addition to the lists of American tonnage with the managing ownership and other data, there is a compilation of Canadian vessels numbering about 1,200, sail and steam. The volume contains 300 pages handsomely bound in cloth cover. Price, $5 per copy.

BUFFALO, N. Y.

Special Correspondence to The Marine Record.

The C. & B. Line have commenced daily service between here and Cleveland. Their boats will start out on Sunday nights after June 1st.

The custom house reports April shipments of coal at 111,997 tons. Shipments for April last season were 178,040 tons. The showing this season is much better than might have been expected,

The Erie canal opened at midnight on Monday. About forty boats cleared. Canal freights have gone to pieces with all the rest of marine business and rates went down to 3¼ to 3⅛ cents on wheat to New York on the opening.

The price of coal for steamboat fuel has advanced to $3.50 per ton. Some of the large lines are said not to have enough coal to last until Sunday. Capt. Shaw was preparing to tow the steamer Charles Eddy to Detroit behind the Selwyn Eddy to save fuel, but finally put the steamer in drydock for calking.

Canal boatmen are more sanguine over the prospect of business than before navigation opened. They believe that the grain must move and that for the grain going to New York for export they are better able to handle it than the railroads. The unknown condition of repairs on the canal near Schenectady makes it uncertain whether boats can make ordinary time yet.

KINGSTON, ONT.

Special Correspondence to The Marine Record.

Your regular correspondent at this port must object to a statement appearing in the last issue of THE RECORD which might be taken as reflecting on the construction of the steamer Rosedale, owned by Hagarty & Co. Your correspondent says that "the Lloyd's inspection of the Rosedale can not stand, as that steamer has had 30 feet put in her since she was built to Lloyds' rules." The facts are that the Rosedale was built with the intention of putting 30 feet of a midship section in the hull to lengthen it, and provision was specially made for this. The work was also done under the supervision of Capt. Thomas Harbottle, the inspector for English Lloyds at Toronto.

When the city council handed over the collegiate school property in the city to the governors of the school of mines, it was on condition that a school of navigation should be started and maintained in connection with the school of mines. Last week a very large delegation waited on Sir Hibbert Tupper, Minister of Marine, to ask the government to assist the school financially. The minister said it was too late to do anything this year, but the government was fully alive to the necessity for such a training school and he would bring the matter to the attention of the government next year. It is proposed to train masters, mates and engineers in the theory of their professions.

The steamer James Swift that last year ran on the Ottowa-Kingston route, will this season run between Ottowa and Alexandria Bay, N. Y., calling at Kingston both ways. This steamer has been fitted with electric lights throughout and a powerful search light to illuminate the crooked channels of the Rideau river. The Rathbun Co., of Deseronto, have just completed large repairs on the steamer Resolute on the marine railway at Deseronto. A lot of new frames were put in the bow section and the hull steel arched and strapped throughout. When the Baltic was unloaded this week it was found that 1,800 bushels of her cargo of wheat were badly damaged. The wheat was sold to the Brantford starch works and was loaded on cars at Port Colborne and taken to that point.

The Rathbun Co., of Deseronto, has bought the logs belonging to the H. M. Loud Co., of Oscoda, Mich., which came over Niagara Falls last winter. A tug is now engaged picking up the logs.

The Donnelly Wrecking Co. sent a diver up to Deserento on Tuesday and found the iron rudder of the tug Rescue, lost while breaking ice last fall in the Bay of

Quinte. The steamer North King left here on Sunday and is now on her route between Port Hope and Charlotte, N. Y. This steamer never looked better than she does this year. Capt. Jarrell is in command with James Hickey as engineer, and E. O'Donnell as purser. The Calvin Co.'s new tug Reginald will soon be ready for work, and when completed will be the speediest and best tug in this district. Capt. John Sullivan will command her.

MAGNET.

OSWEGO, N. Y.

Special Correspondence to The Marine Record.

Referee W. G. Robinson, in his action brought by Capt. Timothy and John Donovan against the Standard Oil Co., of New York, awarded to the plaintiff, including costs, etc., judgment for about eight hundred dollars.

The vessels reached Port Huron and notified the consignee of the loss and then proceeded on to their destination, arriving all well at Oswego August 12, delivering 250,360 feet of lumber to the charterer's order. The latter refused to pay the freight on the amount actually delivered at their dock amounting to $626.25 and the suit was brought.

In their answer the charterers claimed that the lumber was not properly stowed upon deck and that the barge was responsible for the loss which amounted to $669.45. There was a provision in the charter party stating that the vessels would not be responsible for losses occasioned by the elements, and judgment was rendered accordingly.

The plaintiffs were the owners of the tug M. J. Cummings and the barges American and J. R. Noyes. Last summer they chartered with the Standard Oil Co. to carry lumber from Georgian Bay to Oswego. August 3d, last, the tow left Muskoka Mills with 348,580 feet of lumber. On the 6th of that mouth, while in Lake Huron, a few miles from Fort Gratiot light, they were caught in a storm and 98,000 feet of lumber was washed overboard.

SCREW PROPELLERS, REVERSING SCREW PROPELLERS, AND NON-REVERSIBLE ENGINES.

BY MR. ROBERT MCGLASSON, HON. M. I. M. E.

Read at Cardiff, England, December 7th, Stratford, London, England, December 11th, 1893, and at Bombay and Calcutta.

PART 2.

Here we see that area may (within reasonable limits, and allowing sufficient for quickly starting, stopping and reversing according to the particular requirements) be in proportion to revolutions, and also how beneficial it would be in some cases—as has been frequently proved—to "let the engines out" by making the propellers smaller. In Mr. Volk's experiment there could not have been such variation in the friction or the slip, or the speeds of the boat would have differed. These experiments also prove that—when the draught will permit—we do not require too many blades, which have sometimes "locked up" the water and corrected themselves, being found afterwards to do better work with the remaining (smaller) area. How often has a comparatively small portion of an old blade been found to be brightened by activity, and the remainder to be covered by marine growth. The experiment also proves that "cutting the curl" of the fixed (curved) pitch did no harm in the case referred to. My system abolishes all useless and detrimental weight, and has less to oper ate and turn in consequence.

The blades should not be too broad. The larger circumferential revolution of the outer radius indicates the fact that it is better, when designing blades and determining area, to add rather to the length of the blades than to the width. When draught will not permit this —in single screw designs—it is of course better to have twin screws—which I prefer in any case.

There is not so much slip with them in shallow draught, and the two screws could, if desired, be driven from one shaft and my gears applied, by which the manipulating benefits of twin screws would be obtained in a simple manner, and in a service in which it is often wanted.

I have found that with models fitted with blades beginning where they can act, and properly revolved and pitched, no rope of water or disturbance thereof is noticeable. I have weighed pieces of cork and floated them at the level of the screw shaft, and such blades have simply "walked through" them without disturbing their position unless hit. I respectfully submit that the wording of some of the theorems applying to old-time screw propellers—in a hollow between two posts—of fixed pitch, should now be somewhat altered. We want to propel the ship, and to pass through the water with as little disturbance as possible. In a well-designed ship, if the water be properly supplied to the screws and properly treated by them the disturbance caused by the screws themselves would be very trifling, as the water possesses inertia enough to "stand up" against really energetic screws with great advantage to economical propulsion. The reduced time-element makes the liquid wall which the screws push against more solid, and the ship moves more and the water less, relatively speaking. The ship creates, or should do, most of the "wake."

For many boats—as the late Robert Griffiths wrote, and said to friends who have kindly written me on the subject—approximately flat blades are practically as good as any other. Why should they not be? Make the blades of the best section to avoid friction, and not too broad, begin them where they can act, and revolve them quickly enough, and we shall secure a constant pitch angle capable of being set by my system to develop the best propulsive area at all times, both ahead and astern. Such can be made capable of passing through the water with practically equal resistance and effect at all radii by making the bottom of the blade relatively wider than the top so as to equalize the circumferential action of all parts of the blades. But any reasonable shape of blade can be accommodated by my system; in fact, several (popular) "modified Griffiths" have been running equally as well astern as ahead—operated by developments of my gears—for the last eighteen months.

We are told that in fixed screws a true screw or helix —in which pitch multiplied by revolutions is the same at all radii—is supposed to be best under ordinary conditions. If I design the above fixed screw to suit the maximum speed (which is certainly what I ought to do) of a war ship, at which the revolutions are, say, 104 as in the "Edgar," how will this fixed pitch or helix economically accommodate the speeds at which she will run for probably three-fourths of her time, at which speed the revolutions will, say, range between 45 and 55? I contend that the revolutions must be kept at the maximum available or desired, while the pitch and power is made alterable—without stopping—over the whole economical radius.

Having thus barely indicated—more can scarcely be attempted in one paper—a few general ideas upon screw propellers, you will perceive that I can do all I require —in all reasonable cases—by applying the maximum power obtainable at the highest desirable rate of revolution, and by keeping up that normal (highest) rate of revolution, making provision to change the pitch and the power to suit it when alterations in the conditions of running render it desirable. By this I can bring the action of the developed propulsive area more in the plane of motion of the vessel either when desired, when running at reduced speeds, or under equivalent conditions. Keeping up the revolutions will therefore provide an additional element of improved propulsion and ensure further economy.

I can also alter speed, stop, and reverse by the same means, the engines continuing to turn it in but one direction with only the necessary expenditure of power at whatever angle the blades may be placed. In short, I can hereby vary the developed propulsive area from the maximum to nil in either direction, thus ensuring the utmost economy.

The best modern practice has already corroborated the necessity of doing what I suggest, "trial and error" and "cutting and changing" of screws in "crack" boats still goes on, and provision is made in all the best new vessels of most nations for altering the pitch in dock. Why not do it in the water? If it is good to a very limited extent—done in one way, it will be still more beneficial—and to the fullest possible extent—done in another; and will provide the means of suiting the screws to the engines and vessel. For we must do more than meet one set of "average" conditions, which may vary at any time; and we cannot go into dock to change the pitch, and we cannot—now-a-days—afford to stop. And if we did we should not be certain that the pitch we had put on could not be improved upon; and the running conditions might vary again at any moment. We must alter developed propulsive area to suit the then conditions of the ship and surroundings while running.

With regard to the engines, to be able to discard a large quantity of gear and run always in one direction, offers very material advantages, economically affecting the working, the wear and tear, etc., and it also permits of simplification in the arrangement of various parts. Nothing is imported equal to what is discarded from the engine, for my gears are only active when the pitch of the blades is changed or reversed, instead of constantly—whether wanted or not—as the links, with their many vibrating points, are now. The change of direction of movement of the ship will be effected more rapidly and more directly; and as the direction of rotation of nothing—not even that of the screw itself—is changed, the alteration is made smoothly and without extra stress on either engine or propeller. The pressure is always in one direction on the guides, and the brasses will greatly benefit, and "knocking" be prevented. In all the larger engines the whole of the links, the levers, and reversing-gear way-shafts, several eccentrics and rods, and much other gear would be dispensed with, and many complications become unnecessary, and the merely manual labor be thereby much lightened. During the act of changing the position or angle of the blades from full pitch in one direction to full pitch in the other, the torsion strain upon the shaft cannot be increased, the speed of rotation may remain unaltered, and inertia—either of motion or of rest —does not come into play, and cannot affect the magnitude of the stress upon the moving parts. The complete reversal can—without risk of strain of any parts —be made in considerable less time than with reversible engines and fixed propellers and no change in the direction of rotation of any parts is required.

(TO BE CONTINUED.)

The following from Erie, on Sunday last, is a corker: "The whale-back steamer Wilson, towing three barges, got off her course in a fog this morning while bound up from Buffalo, and went ashore on the peninsula. The tug Scott went to their assistance and effected their release after several hours' work." This is nearly as good as the Cork pilot, who, after losing sight of the land spoke a vessel and was told that Queenstown bore N. W. a given distance, he then headed his vessel around and warned every craft off his north-west course until he picked up the land again.

SHOTS FROM THE LOCKER.

The shipments of ore from Marquette last week were 12,023 tons.

The little steamer Dan Kunz, which sank in Sandusky Bay a few weeks ago, is again afloat.

The Wisconsin Central has commenced work at Ashland Wis., under the protection of the United States Marshall with men from the mines. Shipments of ore for April were 9,707 tons.

A Chicago harbor-master named Sullivan, will be investigated on the charge of having received money for giving vessels favorite mooring spots during the winter and discriminating against other vessels without cause.

The American tug Grace hailing from Dunkirk, N. Y., is still waiting at Port Colborne for the Dominion courts to decide whether she will be fined or confiscated for illegal fishing in the Canadian waters of Lake Erie.

Lightship, No. 58, the first built on the lakes for ocean service, was launched at the Craig shipyard, Toledo, on Monday afternoon. In a few days the new lightship will start for the Nantucket Shoals, and will be anchored twenty miles from shore in the Atlantic Ocean.

Work has begun at Robertson's shipyard, Grand Haven, Mich., on a steam ferry boat for the O. N. Taylor Lumber Co., of Ludington. She will be sixty by thirteen feet, with four feet draft and will be used on Marquette Lake.

The steamer Bon Ami which Rogers & Bird have been building at Saugatuck, Mich., was launched Wednesday afternoon. She is 110 feet long by 22 feet beam and 8 feet depth of hold. She will go into the passenger and package freight business between Saugatuck, Douglass and Chicago.

Mr. Irving M. Scott, of the Union Iron Works, San Francisco, writes in comment upon the completion of the Dirigo, the first steel sailing ship built in this country, that his company built the first steel steamer in this country, the Arago, launched in April, 1885, a vessel of 828 tons gross and 450 horse-power.

The Collingwood Dry Dock Co. have carried on a brisk business all winter and there is still a good summer's work ahead of them. William Watts & Son and P. Dougherty have also kept the industry at Collingwood well to the front and have contracts for new tonnage yet to complete.

One of the vessels which was wrecked on the lake coast near Charlotte in the great gale last fall was the Singapore, which went ashore at Forest Lawn. The schooner has been purchased from her former owners and arrangements are being made to re-launch her, so that this castaway may again enter the lists of lake tonnage.

Captain James Davidson, the extensive ship-builder of Bay City, predicts much better times for the lake carrying trade in the near future. He is so confident that he openly offered to wager $100 that Lake Superior ore freight would be up to $1 before the close of sixty days, and to $1.25 before the end of the season. He had no takers. The present Lake Superior rate is 75 to 80 cents.

Peter Gouchea, a marine engineer, has brought suit at Detroit against William S. Deeg and Henry Houghton for $10,000 damages for breach of contract. Gouchea claims that he was engaged by Deeg as engineer of the steambarge H. Houghten for the season of 1893 at $80 a month. When the barge was ready to sail another engineer was engaged. He was unable to get another position and now will try to recover from the owners of the boat.

Capt. D. McKenzie, of the Middle Island life-saving station, has picked up a red morocco pocketbook on the beach. It contained a slip of paper with the name "G. J. Carlisle, No. 1018 Poplar street, Port Huron," and the address of Benno & Dotty, importers, of New York, a pawn ticket issued to George Henry by Samuel Bomach & Co., No. 295 South Clark street, Chicago, and a Chicago & Northwestern mileage book issued to Michael Flannagan.

The following under a Perrysburg date, concerns the new steamer which is to ply between Perrysburg and Toledo: The steamer was built about seven years ago and has been used on some small lakes and rivers in Wisconsin. She is called the O. B. Reed, but it is quite likly that her name will be changed to something which will never fail to divert the thought of all who see it to this peaceful valley of history and grandeur. She may be given an indian name to be called the Mermaid of the Maumee. And she may be given a title that will recall the deeds of "Mad Anthony" Wayne or of those at Fort Meigs. And it may be that old Turkey Foot will be remembered. The Reed is built on the Mississippi plan, draws from 2 feet 9 inches to 3 feet 6 inches of water, and can turn on her keel. She is 124 feet long, with a twenty beam, or thirty-two feet over all, and is equipped to travel about fifteen miles an hour. Her engines are powerful and of one of the best approved patterns, and her hull is remarkably strong and sound.

CLASSIFICATION REGISTERS AND BOOK OF RULES

FOR THE CONSTRUCTION OF STEEL VESSELS AND THEIR BASIS FOR SCANTLINGS.

(By Joseph R. Oldham, N. A. and C. E. Cleveland, O., Member of the Society of Naval Architects and Marine Engineers.)

PART NO. 3.

It being granted that the immersed tonnage cannot be put forward as an absolutely accurate number for comparing various classes of ships so as to regulate their principal scantlings, I am of opinion that "displacement" will meet the case fairly well and will certainly more equably represent the comparative work that most ships have to do than the assumed register tonnage or the prescribed linear measurements, by which system one vessel may be of cylindrical or prismatic form with the bow and stern formed by transverse bulkheads like a scow, and yet her scantlings are not required to be any heavier than a vessel with the same girth of midship section, having both ends fine and a long entrance and run.

Now if the prismatic or cylindrical form were required to terminate some considerable distance before reaching the ends of the vessel, this rule would not be so anomalous, but as it is, I cannot see how it can be defended on at all a scientific basis, though perhaps the girth by length number is no rougher than the estimated tonnage rule, for when looked into it will be found that while the former will permit of a ship being made as full at the stem and stern as at midships, it does give due credit to a sharp midships section over one of square box form, whereas the other formulæ will permit of the middle body being a rectangular parallelopiped and the fore body and after body prisms having isoscles triangles for bases corresponding to a reduction of the body, of the same length as the ship, by some twenty to thirty per cent.

I think that displacement (regulated by the ratio of depth to length) is the most uniform basis on which the principal scantlings contributing to the longitudinal strength of a ship can be based.

It may, however, be objected that to increase the scantlings as the number of tons displacement augments, while the ratio of depth to length remains constant, would not be fairly applicable to ships, say in the tea trade, or in other trades in which light homogeneous cargoes only are carried. Well, the remedy for this may be found in a specially fixed load line for vessels regularly employed in such trades, though on the other hand I am aware that there would be some risk in regulating the principal scantlings of a ship on an arbitrary load line, for the underwriters could hardly rely upon such light loading being adhered to. But in any case the hardship could not be great, and if the scantlings were fixed by the ordinary or legal displacement, the vessel would then be eligible to carry the maximum freight which ships of similar dimensions and model are capable.

There is another point in favor of the displacement basis; it is this; there is no calculation in connection with the designing of a ship so simple and reliable as displacement; moreover, this must be ascertained for every ship in the early stages of designing.

The register tonnage measurement may be radically changed from that worked out in the shipyard, by the government officials, for I can show you sister steamers —exact duplicates—in which the difference in register tonnage amounts to 15½ per cent.

Of course, this is no new proposal, but the first time it appeared in print in any register was two years ago, when it was printed in the "Great Lakes Register of Shipping."

Now before the load line bill became law, displacement as a numeral could hardly have been so recommended, for then two sister ships might be loaded very differently as regards draft of water, and consequently have very different work to do; but this is no longer the case, though some minor interpolations or exceptions will always be necessary, whether the length, girth by length, tonnage or displacement be used as a basis, at any rate for ascertaining the scantling of peculiar ships.

On the inland seas, of course, displacement can be more generally and fairly used than on the ocean, for our shallow lakes, rivers and harbors will always limit the loading, at least for intervals of a year or two at a time, and even our boats which carry grain or oats invariably load to about the maximum draft available in the shallow rivers through which they must pass. So all except purely passenger steamers may be calculated to load to the same draft of water.

The arbitrary powers of the great shipping register societies when assigning a class are practically unlimited with regard to the model or the scantlings, and therefore, eccentric designs or extraordinary arrangements of scantlings may logically be returned to the authors as ineligible for classification, and perhaps the best possible system for comparing ship with ship, so as to obtain equal strength, would not give practical results largely in advance of the present most approved methods of computation, except for ships of great length or extraordinary proportions. Still that is no reason why an effort should not be made to obtain a more accurate guage of different classes of vessels for the purpose of proportioning their scantlings.

Surely a more exact basis can be found for this purpose than the assumption that the horizontal longitudinal plane of ship is formed by parallel sides and square ends in one case and by two equilateral triangles with their bases resting on the transverse planes of the midship body with the corners rounded off in the others?

It may not be waste of time, nor quite irrevalent to my subject, to consider for a moment what has been done in the past in the way of constructing strong ships.

Look at such steamers as the old Ceylon, the Russia, City of Baltimore or Poonah; they showed no signs of distress, and I never heard of troublesome vibration in their day. Now, the peculiarity of those vessels was their great solidity, their fineness of lines and comparative light draft, or rather high free-board; they had small hatchways and narrow shell plates. Or again, consider such a ship as the Tiber, built in the year 1851. She was perfectly sound and strong after more than thirty years' service, and she was in very satisfactory condition when last examined by the writer for reclassification about ten years ago—no corroded butts required filling in her case. This was, however, a peculiar ship, if I remember rightly, the peculiarity being lap riveted shell plates in transverse or vertical connections.

Now this vessel was built to class, and the registers accepted the lap joints and classed and reclassed the ship with such joints, so it can hardly be maintained that the registers deterred this so-called modern advance in a detail of iron ship construction. The great registers may be conservative, as it is their indubitable prerogative to be, bnt improvements are seldom kept back by such conservatism, though mere alterations of an experimental kind may be and should be.

The workmanship on those hulls was excellent, but no better than that in P. & O. boats of to-day, and the weight of iron in them was probably not so well distributed as it is in such steamers now, but they were more rigid than modern steamers and did not carry such a load in proportion to their principal dimensions or register tonnage. Therefore, by the displacement rule, if a greater load were desired in a steamer of such dimensions, say, as the Ceylon, the scantlings would require to be heavier, and with such increase equally satisfactory results might be depended upon.

Much excellent theory has from time to time been expended in the endeavor to ascertain the value of the elements of ships and to formulate an accurate and comprehensive system of measurement for redistributing the materials, but extremely diverse views appear still to be entertained by the authors of the several books of rules in the endeavor to provide a rule for numbers or tonnage on which the ratio of scantlings should depend.

TO BE CONTINUED.

OBITUARY.

CAPT. EDWARD KELLEY.

Another old time and well known Cleveland shipmaster has been ordered to "cross the river" after a

CAPT. EDWARD KELLEY.

lingering illness of some months during which time he sometimes appeared to be taking a fresh hold of life with the tenacity of an old sailor yet the result of his illness has been apparent to his best friends for many weeks and Bright's disease carried him off early on Monday morning last.

The late Capt. Ed. Kelley was born on board ship about fifty-eight years ago, and, following his father's profession, early embarked in the calling of a mariner. His early days were spent between the West Indies and New England ports, eventually to the deep water trade, and finally, in 1854, he came to the lakes, where he has remained ever since, sailing in his early days for the N. Y. C. R. R. Co. and the Union Steamboat Co. out of Buffalo. In 1872 he superintended the building of the steamer Oscar Townsend and sailed her for several years, later taking command of the Wocoken, owned at that time by the late R. K. Winslow, for whom Capt. Kelley had a warm personal regard. The steamers Aurora, owned by Mr. John Corrigan, and the Fedora, hailing from Erie, Pa., were the Captain's latest commands before taking charge of the construction of and afterwards sailing the Toledo, Ann Arbor & Michigan R. R. Co.'s ferry steamers and ice crushers used in keeping open winter communication across the north end of Lake Michigan.

Capt. Kelley enjoyed the distinction of being elected the first president of the Cleveland branch of the Shipmasters' Association and held the good will of his associates, shipmates and acquaintances in a remarkable degree. Members of the above association and a large number of friends attended the funeral on Wednesday morning.

PLANET NOTES FOR MAY.

Mercury will be at superior conjunction, i. e., behind the sun, May 20, 9 h. 44 min., central time. During May this planet will be wholly hidden to the eye by the glare of the sun, although it is calculated to reach its greatest brilliancy on the 23d.

Venus will be in good position for observation about 4 o'clock in the morning during May. Her phase will increase from about half to two-thirds during the month, while her brilliancy will diminish in the ratio of 137 to 97 in the same time, because of her recession from the earth. Venus and the moon will be in conjunction May 31, at 3 h. p. m.

Mars is also to be observed in the morning. He is about 30° west and 14° south from Venus, in the constellation Capricorn, and will move northeast into Aquarius during May. At the end of the month he will be found about half-way between the first magnitude stars Fomalhaut (a Piscis Austrini) and Markab (a Pegasi).

Jupiter and Neptune will be too low in the west during the early evening hours for any satisfactory observations during this month. On Poole Bros.' map for this month, however, the courses of Jupiter and Neptune among the stars are indicated for the six months from April 1 to September 1.

Saturn will be in best position for observation during May, crossing the meridian about 10 o'clock in the first half and 9 p. m. in the latter half of the month. The rings of Saturn are now pretty well widened out, so that the three parts can be distinguished readily and the Cassini division can be followed all the way around. The elevation of the earth above the plane of the rings is about 12°. Saturn is in the constellation Virgo, about 5° north of the first magnitude star Spica, with which he is almost equal in brightness. A conjunction of the moon and Saturn occurs May 16, at 10 h. 55 m. a. m.

Uranus is also in good position for observation, being at opposition May 3.—*Popular Astronomy.*

NOTICE TO MARINERS.

SURPRISE SHOAL BELL BUOY.—An iron bell buoy is maintained during the season of navigation on Surprise Shoal, between Cabot Head and Cape Croker, in the Georgian Bay, off the coast of the North Riding of Bruce, Ontario. This buoy was first placed on the 22d October, 1893. Lat. N, 45° 3′ 27″ Long. W. 81° 1′ 20″ The buoy is painted red and is moored in 6 fathoms immediately north of the 9-foot patch at the west end of the shoal. Patches with less than two fathoms extend for nearly a mile east of this place. Deep water will be found two cables south of the buoy.

COLOR OF GARGANTUA LIGHT.—The light on the summit of the small island at the mouth of Gargantua harbor, Lake Superior, has heretofore been fixed red, although advertised and included in the Canadian list of lights and fog signals (No. 1123) as a fixed white light.

From and after the opening of navigation this year the light will be maintained as a fixed white light as originally intended.

SHOAL IN LAKE SUPERIOR.—Mr. T. H. Elliott, fishery officer at Sault Ste. Marie, reports the existence of a shoal about ¼ mile in diameter, with 5 feet of water over it, about midway between Montreal Island and Point aux Mines, on the east coast of Lake Superior.

A line drawn from the west end of Montreal Island to the point passes over the middle of the shoal.

WM. SMITH,
Deputy Minister of Marine and Fisheries.

Department of Marine and Fisheries, Ottawa, Canada, 18th April, 1894.

UNITED STATES OF AMERICA—NORTHERN AND NORTHWESTERN LAKES—WISCONSIN.

KENOSHA PIERHEAD RANGE LIGHT.—Notice is hereby given that on or about May 12, 1894, a fixed red light will be established on the outer end of the N. pier, Kenosha Harbor, Wisconsin.

The light will be shown from a lantern in an inclosed glazed end of a conduit extending from the pierhead light tower a distance of 100 feet. The focal plane of the light will be 28 feet above lake level.

With the present pierhead light the light will form a range for approaching the harbor.

By order of the Light-House Board.

JAMES A. GREER,
Rear Admiral, U. S. Navy, Chairman.

Office of the Light-House Board, Washington, D. C., April 30, 1894.

MARITIME LAW.

CHAPMAN DERRICK & WRECKING CO. vs. THREE TUGS. CORNELL STEAMBOAT CO. vs. THE ALFRED.

District Court, S. D. New York. January 23, 1894.

1. COLLISION—VESSELS AT ANCHOR—CROWDED CHANNEL—DREDGE LAWFULLY MOORED. It is obligatory on their owners to raise, when practicable, vessels sunk in collision. Hence, a derrick anchored in the channel of the East river under a permit from the Secretary of the Treasury, occupied in raising a sunken vessel, and, though a partial obstruction to navigation, not such a complete obstruction as to constitute a nuisance, was held not unlawfully anchored, though off the regular anchorage grounds, and not in fault for damage suffered by a vessel which collided with her.

2. SAME—DREDGE ANCHORED IN NARROW CHANNEL WAY—LIABILITY OF COLLIDING VESSELS. A derrick anchored in the crowded channel way of the East river, engaged in raising a sunken vessel, although not unlawfully in such position, was held not entitled to all the immunities of vessels anchored on anchorage grounds; and certain tugs, which collided with her in spite of skill and diligence exercised by their pilots, were held not responsible for the damage to the derrick.

3. SAME—ANCHORAGE GROUNDS—ACT AUTHORIZING SECRETARY OF TREASURY TO ESTABLISH—APPLCATION TO VESSELS ENGAGED IN RAISING WRECKS. Whether the anchoring of a derrick for the purpose of raising a wreck falls within the purview of the act of May 16, 1888 or the authority of the Secretary of the Treasury thereunder, "to define and establish an anchorage ground," etc., quaere.

Brown, District Judge.

HIGBEE v. NINETY-SIX HUNDRED CASES TOMATOES.

District Court, D. Rhode Island. February 3, 1894.

ADMIRALTY—PRACTICE—PAYMENT INTO COURT—RIGHTS OF LIBELANT. On libel for freight, where the claimant pleads a tender, and pays the amount tendered into the registry of the court, the libelant is entitled to an order for the payment of that amount to him before there is any trial of the issue. Mayor, etc., vs. Patten, 1 Cranch, C. C. 294, disapproved.

In Admiralty. On motion for the payment of money paid into court. Libel by Harry E. Higbee against 9,600 cases of tomatoes for freight. Motion granted.

Carpenter, District Judge. This is a libel for freight money, and the claimant, in his answer, alleges a tender and, in support of this allegation, has paid into the registry of the court the sum of $470.70, being the amount of the alleged tender. The libelant now moves for an order for the payment to him of this sum. The claimant resists the motion, and cites Mayor, etc., vs. Patten, 1 Cranch, C. C. 294. The whole report of that case is as follows:

"Plea of tender, etc. Before trial of the issue, Mr. Swann, for the plaintiff, moved the court for leave to take out the money, and go on for the balance of his claim. 'Esp. N. P. 161. The court thought the plaintiff could not take the money out, and then proceed for more."

The case is certainly in point, but it does not appear to have been decided on argument, and is, therefore, not strictly an authority; and I can perceive no reason on which it is based. The tender implies a consent on the part of the claimant that the money in court is the property of the libelant, and it therefore must be paid to him in any event, and there seems no reason why the payment should not now be made. If it be found that there was, in fact, a tender, and that the tender was for the full amount due, the claimant will recover costs, which, as in all other cases of suits on claims ascertained to be unfounded, is taken to be full compensation. The principles laid down in 'Espinasse and the cases there cited seem to point to this conclusion, with which they are in no respect in conflict. There will be an order that the fund be paid to the libelant, after deducting the fee chargeable by the clerk.—Fed. Rep., vol. 59, No. 7.

NELSON v. THE PREMIER and THE WILLAMETTE

District Court, D. Washington, N. D. February 5, 1894.

1. COLLISION—INJURIES TO PASSENGERS—LIABILITY. A steamer guilty of culpable negligence contributing to a collision is liable for resulting injuries to passengers on the other vessel, although it also may be guilty of fault contributing to the disaster.

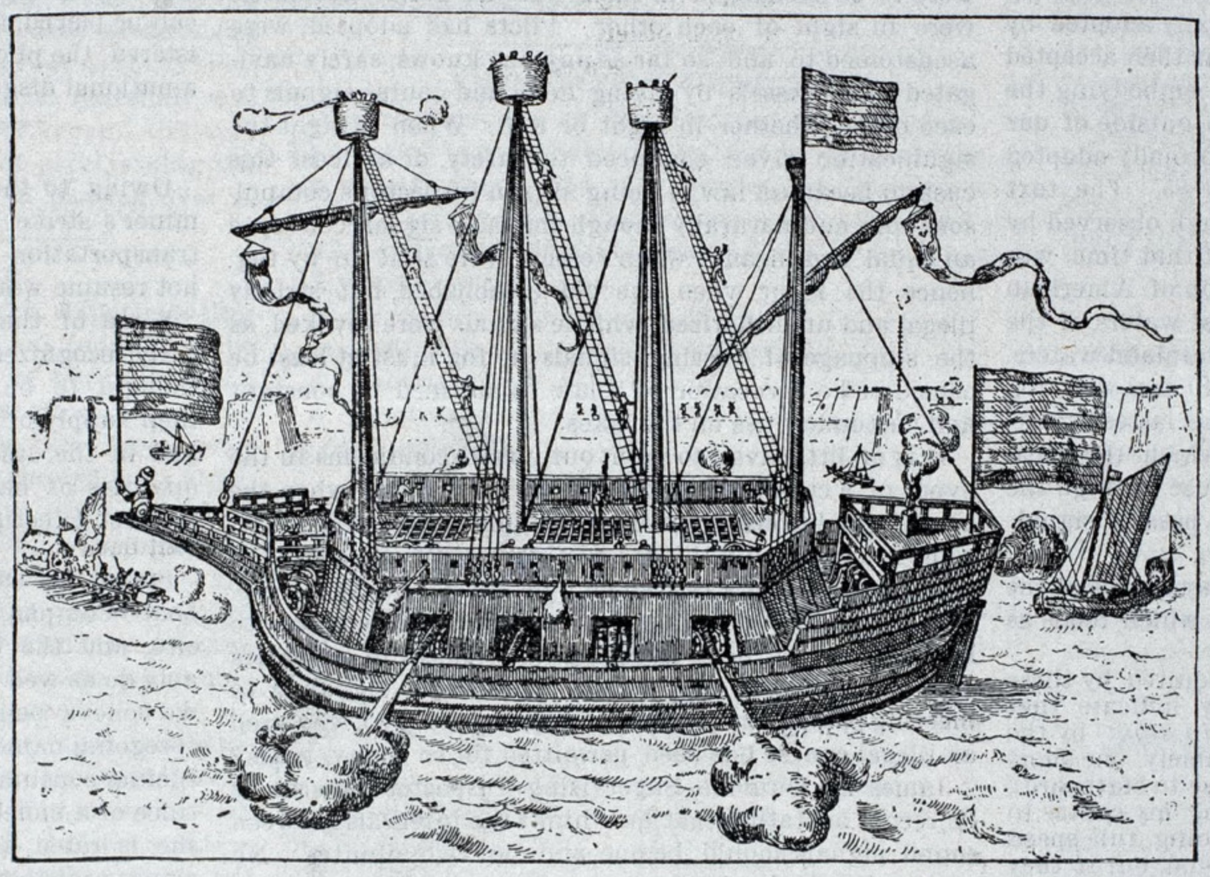
2. SAME—FOG—EXCESSIVE SPEED. A steamer which deviates from her proper course and continues at full speed, in a fog, notwithstanding the known proximity of another vessel, as indicated by her fog horn, is guilty of fault when collision ensues.

3. SAME—DEATH OF PASSENGERS—SUIT BY PERSONAL REPRESENTATIVES—ADMIRALTY JURISDICTION. The personal representatives of passengers killed in a collision can maintain a suit in admiralty in a federal court against the vessel in fault, when the local law gives them a right of action, and makes the damages a lien on the vessel, as in Washington by 1 Hill's Code, § 1678, and 2 Hill's Code, §§ 138, 148.

In Admiralty. Suit in rem to recover damages for personal injuries to passengers, resulting from a collision of the steam collier Willamette with the passenger steamer Premier. Findings and decree for libelants.

A MEDIAEVAL IRONCLAD.

When writing on "A Man-of-War of 1893" in *The Graphic* of February 10th, Commander C. N. Robinson, R. N., mentioned the fact that an armored vessel was constructed in the sixteenth century, thus proving that the idea of protected ships is by no means an absolutely new one. This early ironclad was built in the year 1585 by a shipwright of Antwerp during the wars with the Spaniards. The greater part of the Netherlands had come into the possession of the house of Hapsburg by the marriage of Maximillion of Austria to Mary, daughter of Duke Charles the Bold, in 1477, but under Charles V. the sovereignty was extended until it embraced all the seventeen Belgian and Batavian provinces. When the Lowlands passed to the Spanish crown the principles of the Reformation had spread among the Lowlands, and on the establishment of the inquisition there in the midst of the sixteenth century, disturbances broke out in the colonies and great cruelties were committed by the Spaniards. Antwerp, which in those days was a margraviate, suffered greatly. It was pillaged by the Spanish soldiery in 1574, and was again besieged in the regency of Alexander of Parma, being taken in 1585. In the summer of that year it was closely invested by land and water, and the people of Antwerp made many gallant efforts to break through the line of besiegers, especially on the river. For this purpose they built a craft of unusual size, with a flat bottom, and armed its sides with iron plates fastened into great



A MEDIAEVAL IRON-CLAD, A. D. 1585.

beams of wood. The idea was to make not so much a ship as a floating castle, impregnable to the artillery and missiles of those days, which should crush all opposition. It contained a great number of men, some of whom were placed like sharpshooters in the tops of the masts, and the rest protected by the bulwarks. The men of Antwerp were so confident of the success of their new invention that they called it *Finis Belbi*, feeling sure that by its means they would be able to raise the seige and put an end to the war. Unfortunately for the brave bughers of Antwerp, this early ironclad proved a disastrous failure. It was launched upon the Scheldt, and taken across the flooded country by means of a canal cut from the river; but it proved very unhandy and after a short career got stuck upon a bank. This untimely end of the great vessel from which so much was hoped was a source of much delight and derision to the Spaniards, who nicknamed the monster *Caranjamaula*, which signifies bogey, while the men of Antwerp altered its name from *Finis Belli* to *Perditæ Expensæ*, or "Money thrown away." The crew then deserted the ship, and the Spaniards, after a naval battle, which took place in the flooded country and resulted in the defeat of the Netherlander, took possession of the naval monster, as they called it, though they feared that, like the Trojan horse, it had been left in their hands from some evil purpose. However, finding that it was really deserted, they seized it, lightened it, and then towed it off and got it back into the river Scheldt. It was then taken in triumph to the camp of Alexander of Parma, where it became one of the sights of the time; and the Spaniards, accepting the omen of its original name, took it as a sign that the war was finished. And, indeed, it proved to be the last effort of the gallant people of Antwerp, for the city was taken on August 17th, 1585, and so the first ironclad on record came to unfortunate end.—*Scientific American.*

THE NEW BRIDGE AT CHICAGO.

The recently completed bridge over the south branch of the Chicago river is the only one of its kind in existence, and it is certainly a radical departure from the ordinary swing bridges now spanning and obstructing all navigable rivers. The principle upon which the new bridge works may be described as similar to raising or lowering a window. On either bank rises a tower of iron lattice-work 191 feet high. The bridge, 89 feet in span and weighing 300 tons, extends between them, its ends fitted into groves. It is fitted with counterweights, cables and pulleys, all of which are governed by a 70 horse power steam engine. When the bridge is to be opened the engineer throws off the balance, and the bridge rises smoothly and horizontally in its grooves, halting at a height of 155 feet. It is probable that so ingenious a structure will be widely adopted at all of the principal lake ports, as its advantages are self-evident.

FASTEST OF HER TYPE.

An account of the official trial of the new British torpedo-boat destroyer Hornet, which recently took place on the Thames, shows that the craft is the fastest vessel of her type afloat. During a three hours' trial the average speed per hour was found to be 27.628 knots. This considerably eclipses any previous performance of any vessel of the Hornet's class. The best record claimed by any other builder of boats of this type is 27.22 knots per hour, said to have been made by the Chevalier, which was constructed by M. Normand, of Havre.

The Hornet is one of thirty vessels recently ordered by the British admiralty to be constructed at a cost from £33,500 to £39,000 each. Two of the boats were built by Yarrow & Co. They are the Havock and Hornet. With the exception of boilers, both are alike in every particular. The Havock, which was fitted with locomotive boilers, has not proved to be as fast as the Hornet, which was equipped with the Yarrow patent water-tube boilers.

It was stipulated in the contract that the Hornet should make a speed of 27 knots per hour, with a load of thirty-five tons on board.

The disadvantage under which ordinary first-class torpedo boats labor is their loss of speed in a heavy sea. These larger and more powerful craft were constructed after the torpedo type for the purpose of overhauling the torpedo boats in a storm.

The Hornet is a twin-screw boat, 180 feet long and 18 feet 6 inches beam. The propellers are three bladed. The engines are of the tri-compound type, having cylinders 18 inches, 26 inches and 39½ inches in diameter by 18 in stroke.

The two sets of inverted triple expansion engines are capable of developing collectively 3,600 horse power, each set of engines driving a screw. There are two surface condensers, two centrifugal pumps and engines for driving them, fan engines, steam bilge pump, evaporator and distiller, air compressing engines and engine dynamo for the search light, and the engine for steering the boat.

The armament consists of an 18-inch bow torpedo tube for firing directly ahead and two 18-inch swivel torpedo tubes for side firing, placed on the turntable aft. On the forward conning towers, well elevated above the water line, is a 12-pound quick firing gun. There are two 6-pound quick firing guns, one on each side, and a 6-pounder placed on a high stand near the stern. There is a water-tight flat, or lower deck just above the water line, from the stem to the forward stoke hold, adding greatly to the safety of the boat in case of collision. The coal carrying capacity is sixty tons. The supply is believed to be sufficient for a run of 4,000 miles at a ten-knot speed. The complement of officers and men is forty-two. The Havock is reported to have made the marvelous average speed of 30 statute miles an hour on a run of 100 miles.

SOLAROMETER TESTED.

An official report has been made by Lieutenant William H. Beehler to the Secretary of the Navy upon a test of his solarometer, which he made on board of a North German Lloyd steamer during a twenty-nine days' voyage. The report states that the test was very successful, the instrument accurately determining the latitude, longitude and compass errors by observations of the sun, moon and stars whenever visible, independent of the invisibility of the sea horizon and without elaborate calculations. Lieutenant Beehler has secured permission to place his instrument on board one of the North German Lloyd vessels and tonavigate her by the instrument on a voyage in the near future.

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PASSING SIGNALS IN FOG.

There seems to have been a general misapprehension relative to the signals which steam vessels are permitted to use in fog, mist or falling snow, and at such times as when the fog signals of other vessels in the vicinity may be heard without the vessels sighting each other.

Placing the rules of the Board of Supervising Inspectors on one side for the purpose of reaching the 1885 question, at which date it is generally thought the new rule went into effect, we find that the Revised International Regulations, so-called for preventing collisions at sea, issued in pursuance of the British merchant shipping act (amended act of 1862) had been generally adopted by maritime countries. This code, which was then accepted as an integral part of the law of the sea embodying the "rule of the road" in so far as navigation outside of our territorial waters was concerned, was formally adopted by the United States Congress March 3, 1885. The text of these revised regulations, which although observed by all vessels on the coasts and oceans at that time, was given the sanction of law in the navigation of American vessels upon the high seas and in all coast waters of the United States except harbors, lakes and inland waters. In these regulations Articles 12, 13 and 19 deal with fog signals, and it is from the wording of the latter article, coupled with the persistent whistling which the local inspectors on the lakes have forced into use through the rulings of their Board, that the misuse of passing signals in fog has no doubt sprung.

To fully appreciate the situation we may glance at the contents of Article 19, above referred to, which reads as follows:

"In taking any course authorized or required by these regulations, a steamship under way may indicate that course to any other ship *which she has in sight* by the following signals on her steam whistle, namely, one short blast to mean, 'I am directing my course to starboard;' two short blasts to mean, 'I am directing my course to port;' three short blasts to mean, 'I am going full speed astern.' The use of these signals is optional, but if they are used the course of the ship must be in accordance with the signal made."

The italics in the foregoing literal quotation are ours, and it is quite easy to see how the letter of the law has been violated or avoided. Instead of giving the optional signals to a vessel in sight only, they have been given as a fog signal when it was not known how the object from which the sound emitted was proceeding.

The members of the recent International Marine Conference could not evolve rules so as to permit vessels to maintain their speed in fog by indicating courses steered, or intended helm signals to be given under which two or more steamers might avoid each other when acting solely on the bearings of their whistles. They no doubt widely appreciated the aberration of audibility of sound in fog, and realized that volume and direction of sounds were frequently unknown quantities in variable atmospheres. However this may be, the question was threshed over in committee and convention with the foregoing result, nor do we see even at this date that any safe and concise code could be furnished to the mercantile marine for navigating crowded waters in thick weather without slowing down and exercising the usual precautions observed under those conditions.

It is clear that with the adoption of a universal code in 1885 the public and private vessels of the United States had to be ruled thereby. But we become somewhat misty on this point when it is considered that the Board of Supervising Inspectors of Steam Vessels, established by act of Congress in 1852, quote Revised Statutes, Section 4412, as follows: "The Board of Supervising Inspectors shall establish such regulations, to be observed by all steam vessels in passing each other, as they shall from time to time deem necessary for safety." Again in Section 4413: "Every pilot, engineer, mate or master of any steam vessel who neglects or willfully refuses to observe the regulations established in pursuance of the preceding section shall be liable to a penalty of fifty dollars and for all damages, etc." Furthermore, we may quote Section 4463 R. S., clause 13: "Pilots of steam vessels, while in the discharge of their duties, must be governed by the rules of the Board of Supervising Inspectors, made for their guidance, and not by any instructions emanating from any inspector or other person." Then, to further mystify the situation, the international steering and sailing rules are printed as governing the steamboat inspection service, although special pilot rules for lakes and seaboard, and another different set of special pilot rules for western rivers flowing into the Gulf of Mexico and their tributaries, all of which are authorized by special acts of Congress, differ from the universal usage as adopted by the United States in 1885 with the palpable result of the conglomeration causing confusion, inasmuch as few if any lake pilots clearly realize under which code or by what authority certain rules may be arried out.

Such a condition of affairs could not possibly exist on crowded waterways in any other portion of the globe, yet more honor to the practical men who have so studiously and skillfully navigated their vessels on the lakes as to avoid complications of signalling and by adopting their own methods have steered clear of untold collision scrapes and other dangers in meeting, passing and crossing vessels, both sail and steam, in a fog or clear weather.

Having therefore established a safe or rather a customary private law for passing steamers in thick weather, and one which has been the rule during the whole course of steam navigation on the lakes, one may easily judge of the consternation which prevailed and still exists when on the opening of navigation the Supervising Inspector issued a mandate that nothing but fog signals were to be exchanged in thick weather unless the vessels were in sight of each other. Pilots had adopted, were accustomed to, and, so far as any one knows, safely navigated their vessels by giving helm and course signals to each other, whether in sight or not. When in sight the signification given conduced to safety, or at least this custom became a law, it being also an inspector's compulsory rule, and naturally enough the same signals conveyed an equal significance when vessels were shut in by fog; hence the furor when the old established, but strictly illegal and unauthorized, whistle signals were revoked, as the stoppage of passing signals in fog must at least be considered a revocation of a law established by constant and customary use on the lakes.

It is of little avail to point out unsafe conditions in the event of a certain procedure being carried out, when the actual conditions have been met and successfully overcome for years, and this is exactly the position relative to passing signals in a fog which now faces the lake marine, though in this connection we are somewhat curious to know if all the men licensing the officers of steamers were not aware of the system in use for signaling to meeting passing and crossing steamers, and if so, why such an illegal course has been permitted for so many years?

James A. Dumont, Supervising Inspector-General, is on record as stating that he "thinks the intervals between sound signals should be one and not two minutes. No course signals should be given. Ships should run slow in fog, with frequent stoppages. Bells should be rung every two minutes. Helm signals in all weathers should be compulsory." It is therefore in the spirit of the latter assertion that lake pilots have hitherto acted, and the Inspector-General can not do less than support the views of the entire sailing fraternity on the lakes in their efforts to amend the statutes relative to helm signals being made compulsory in all weathers, though for the life of us we can't see their use in clear weather if the full text of the steering and sailing rules is properly observed.

In the supposed extracts from the Revised Statutes on which the present pilot rules are based, the wording and diagrams are beyond the pale of criticism in their inadaptibility and crassness, and each situation depicted by diagrams is open to condemnation. The first diagram, of vessels meeting head and head, says that both must port, but before doing so each must give one blast of the steam whistle. The whistle signal being thus given the precedence of action authorizes many pilots to blow two blasts when desiring to pass on the starboard side of a meeting steamer, and as the second vessel is not permitted to cross whistles, two blasts must be returned as an answering signal, hence rule and diagram 1 are rendered null, as the pilot first reaching his whistle commands the situation, and this system is carried out in lake practice. Diagram 2 is nonsensical and a waste of time to glance at, no action being required, as both vessels must pass clear, but even in this case also two blasts of the steam whistle is previously given, though previous to what is another enigma, as danger could never approach either vessel when passing on parallel courses half a mile distant from each other. The third diagram of the Board of Supervising Inspectors' rules is exactly the opposite of diagram 2 and the vessels are passing clear port to port. Here again signals are to be used. In fact, according to rule 6, "The signals by the blowing of the steam whistle shall be given and answered by pilots in compliance with these rules, not only when meeting 'head and head' or nearly so, but at all times when passing or meeting at a distance within half a mile of each other, and whether passing to port or starboard."

Perhaps the most lubberly section of these rules and diagrams is rule 2, diagram of fourth and fifth situations, where a steamer having another on her own starboard side is told to port, not to keep clear or give way, but distinctly to port. Such is the explanation given of the diagram. But the wording of the rule itself is more noncommittal, for it says, "When steamers are approaching each other in an oblique direction (as shown in diagrams) they shall pass to the right of each other, as if meeting 'head and head,' or nearly so, and the signals by whistle shall be given and answered promptly as in that case specified." It is, of course, needless to state that such a rule is not observed; in fact, it is a matter of ridicule, as no pilot would port to a vessel close aboard on his starboard side; hence it is time that this ancient port helm solecism should be wiped out of the rules; in fact, it never had any place there, as the principles of the rules are founded on a steamer having another on her own starboard side giving way or keeping clear according to the judgment of the person in charge, and porting without regard to the speed of the boats is about the last thing an officer would do or think of in such a position.

Sufficient has been pointed out to show that holes may be kicked through the present steering and sailing rules by any one who cares to notice or peruse them. Why then should the code not be reconstructed and a positive, concise codification of laws be issued for the governance of the lake marine? Radical changes are not desirable, and rules now in force clipped of their verbiage and thoroughly explained cover all situations in which vessels can be placed, though as at present issued, if not administered, the pilot rules quoted for lakes and seaboard are a national disgrace and a practical humbug.

SAVING FUEL.

Owing to the scarcity of fuel on account of the coal miner's strike, it is probable that a partial stoppage of transportation by lake will eventuate if the miners do not resume work in a few days.

Some of the managers on line boats out of Buffalo early recognized the situation, and with a degree of forethought to be commended, are endeavoring to husband their supply of fuel by reducing the speed of their boats and in the case of one fast boat, testing the steaming qualities of hard coal, which, according to the result of the first experience has been pronounced as very satisfactory.

Steam was easily kept up this week in the Union Steam, boat Company's Liner Owego while using anthracite, and the Chemung, her sister ship, would probably do as well retaining the same grates, both vessels we believe being equipped alike. In such boats as the foregoing named "flyers" a considerable reduction in the fueling consumption might no doubt be made at the sacrifice of a moiety of speed. In the case of the Chemung, she is rated as capable of indicating 2,400 H. P., but using probably when loaded about 1,800 I. H. P., under ordinary conditions if we take the time honored though often attacked admiralty formula $\frac{D^{\frac{2}{3}} V^3}{C}$ we find this gives her a speed of 14½ miles per hour, assuming the displacement to be 3,500 gross tons. Further, if we suppose the speed to be reduced to 12 miles per hour then by the same formula this would only require an expenditure of 1,000 indicated H. P., thus showing a difference of 800 H. P. for a diminished speed of 2½ miles per hour.

Now, although the triple expansion engine is usually credited with being able to produce I. H. P. for every 1½ or 1¾ pounds of coal consumed in the furnaces, it may safely be said that such a high state of efficiency is rather the exception than the rule, and it would be perhaps nearer the mark to allow 2 pounds of coal per I. H. P., as covering all conditions of weather, quality of coal etc. Then in this instance, for 800 H. P., we find a saving of 1,600 pounds of fuel per hour at the expense of a moderate reduction in speed.

Managing owners are, of course, thoroughly alive to every available chance for exercising economy in the handling of their floating property and the easiest gait at which each steamer can get over the ground is no doubt closely tabulated until the desired point has been arrived at. It now looks as if past experiences in this line will soon have to be more strictly observed and every ounce of power taken out of the "black diamonds."

A LIVELY discussion took place in the Dominion House of Commons at Ottawa on Monday relative to deepening the St. Lawrence system of canals to twenty feet. The estimated cost of such a project is placed at $140,000,000 and this amount the government did not feel disposed to expend although the improvements now being carried out giving fourteen feet instead of nine feet, as formerly, was ably supported.

MORE BRIDGE TROUBLE IN CHICAGO.

Vesselmen are opposed to the plan of the Northwestern Elevated Railroad Co. for bridging the river just east of Wells street. They say a bridge at this poiut would be a great obstruction to navigation in Chicago, and that it would have the effect of reducing the available depth to which boats can be loaded one foot. Capt. Marshall, Corps of Engineers, U. S. Army, in charge of Chicago harbor, has asked for a conference with the members of the Lake Line Agents' Association for Thursday.

The proposed bridge would be too near the La Salle street tunnel. The extreme depth of water over the tunnel is in the center of the river and is a little over sixteen feet. Half-way from the center of the river to the dock, the slope of the tunnel decreases the depth of water one foot. Deeply laden vessels going down the river now have to go through the south draw of Wells street bridge, and swing out into the river and cross it in the center, going through the north draw of Clark street bridge. Lying as it does only one block from the bridges, the crossing of the tunnel can barely be done by large steamers with full cargoes of grain. As the draw of the Wells street bridge is barely wide enough for big steamers to pass through it would be impossible for them to swing out to the center of the river so as to cross the tunnel at its greatest depth of water with the center pier of the proposed railroad bridge in place. It is well known that the loss of the last foot on the depth of a big modern steamer in the grain trade means a lessened carrying capacity of many thousand bushels of grain. With incoming steamers the effect is the same. Nearly all the merchandise is consigned to docks above Wells street bridge and boats would have to load a much smaller cargo when consigned here than they do now. This would mean a loss of many thousands of dollars to vessel-owners and would be the means of diverting a great deal of business away from Chicago River. Capt. Marshall will make soundings at the depth of water around and over La Salle street tunnel with a view of ascertaining the exact depth of water boats can draw in passing over it.

ALUMINUM BRONZE.

Mr. Warren, of Liverpool, has been experimenting lately whith aluminum bronzes, and has found that the presence of a very small admixture of boron makes a denser and more durable alloy. This aluminum boron bronze casts and melts well, and is free from some drawbacks met with in working with the ordinary aluminum bronze. Producers of that alloy often complain of the difficulty experienced in obtaining a uniform mixture, for a difficult fusible alloy sometimes forms on the surface of the molten portion, and, being accompanied by surface oxidation, refuses to alloy with the remainder. The aluminum boron alloy forms at a lower temperature than when pure aluminum is used.

In preparing this bronze Mr. Warren first makes ingots of aluminum containing boron in the same state in which graphite exists in cast iron. These ingots are made by introducing aluminum into a molten mixture of fluorspar and vitrified boriex anhydride, which has been heated in an oxy-hydrogen furnace until fumes of boron-fluoride appear. The boron is immediately reduced and it dissolves in the aluminum, and the alum inum is rendered crystaline and brittle thereby. When added to copper in the proportion of 5 to 10 per cent. it forms the aluminum boron bronze in question, which is not brittle. The effect of boron on the bronze would appear to be quite different from that of silicon, which generally ruins all bronzes when present even in minute quantities.

INLAND LLOYDS SUPPLEMENT FOR MAY.

Manager McLeod has issued the May supplement to the Inland Lloyds vessel register, and it contains a list of vessels whose condition it was unable to vouch for owing to their holding cargoes during the winter months. Valuations are slightly raised on several boats and two new boats are added to the register, the propeller Normandie and barge W. R. Moore, 588 tons, with an estimated valuation of $30,000.

CONSTRUCTION OF BOILERS.

Gen. Dumont, the supervising inspector of steam vessels, has issued the following instructions to manufacturers of boilers and boiler plate: "Notice is hereby given that the inspection of iron and steel plate under the act of Congress approved January 22, 1894, and department circular No. 22, dated February 6, 1894, must be confined exclusively to the inspection of iron and steel to be used in the construction of boilers of steam vessels. Manufacturers of boiler plate will hereafter be required to include in their application for inspection of plate at the mills, the following information: Name of steamer, if she has one, upon which the boiler is to be used for which the plate is ordered; if the steamer is not yet named, then the name of the builder of hull; for whom built; waters upon which the steamer is to be navigated; United States local inspection district in which she will be inspected; number of thickness of plates for shell, steam chimneys, linings of same; shell of steam and mud drums; thickness of head and side sheets, domes, crown of furnace. To insure prompt inspection of their material, manufacturers of boilers for steam vessels should supply the above information when forwarding their orders to the mill,"

REDUCTION IN INSURANCE RATES.

The Chicago board of marine underwriters reduced insurance rates on grain on Monday to 50 cents per $100 to Buffalo, and to 60 cents to Ogdensburg. The latter rate is unusually low, and is to enable the Ogdensburg rout into New England to better compete with the Grand Trunk via. Port Huron and Georgian Bay. To Port Huron, Sarnia and Detroit river, 40 cents; to Georgian Bay, 50 cents; to Lake Erie, 50 cents; to Lake Ontario, 60 cents; to Montreal, 70 cents.

NEW CAR FERRY STEAMERS.

It is reported that Ratcliffe Baldwin, of New York of the Allen line of steamers and Col. Dick, president of the Pittsburg, Conneaut & Lake Erie Railroad, have organized a company to run a line of coal steamers on Lake Erie between Conneaut and Port Dover, Canada. Specifications for the construction of the steamers to be used in the enterprise are now under consideration. The plans call for steamers capable of carrying 40 cars of coal of 30 tons each and which will be guaranteed to run through the winter, provided the ice is not more than 24 inches thick. The boats are to be ready for service by March, 1895.

NAVIGATION CONGRESS.

The next meeting of the International Congress on Navigation is to be held at The Hague, Holland, during the present year. The last meeting of this Congress was at Paris in 1892. The subjects to be considered are:

1. Construction of canals which allow a rapid transit.
2. Equipment of ports.
3. Prevention of blockades of ice.
4. Locomotion on canals and rivers.
5. Dues on navigable waters.
6. Relation between the profile of rivers and the depth of their channels.
7. Regulation of rivers for low water.

EXPIRATION OF INSPECTION CERTIFICATES.

The following is a list of steamers whose certificates of inspection run out during the month of May, 1894, in Chicago district:

Lora,	May	2	Mollie Spencer,	May	18
New York,	"	3	R. Prindiville,	"	18
Boston,	"	3	Geo. B. McClellan,	"	18
Portland,	"	3	James McGordon,	"	18
Uncle Charley,	"	5	Novelty,	"	19
W. H. Wolf,	"	5	Claribel,	"	22
Wm. Rollar,	"	5	Ivanhoe,	"	22
Niagara,	"	5	M. Shields,	"	22
Horace A. Tuttle,	"	6	L. B. Johnson,	"	23
Danube,	"	8	Di Vernon,	"	23
Geo. T. Burroughs,	"	8	Waupoose,	"	23
Welcome,	"	9	Peter Dalton,	"	24
Alpha,	"	9	Ferd'nd Schlesinger	"	24
Catherine,	"	9	Glad Tidings,	"	25
E. D. Smith,	"	10	Washington,	"	26
Luther Loomis,	"	10	Isabella B. Joyce,	"	27
Charles Reitz,	"	10	Mollietta,	"	27
Richmond,	"	11	Australia,	"	27
Providence,	"	11	Aloha,	"	27
Minnie B.,	"	12	Mentor,	"	29
City of Henry,	"	12	America,	"	29
Ionia,	"	12	Fire Proofer,	"	30
R. J. Gordon,	"	15	James Hay,	"	31
John A. Dix,	"	15	Charm,	"	31
Alfred P. Wright,	"	16	Berrien,	"	31
Argo,	"	18	Albert,	"	31

CANADA AND THE ST. LAWRENCE CANALS.

Mr. Dennison, one of the representatives of Toronto to the Dominion House of Parliament introduced a resolution on Monday, to deepen the St. Lawrence canals so as to secure a uniform depth of twenty feet from Lake Superior to Montreal. If this was done, he argued, vessels laden with wheat would leave Port Arthur and Duluth for Liverpool without trans-shipment, saving 5 cents a bushel on the carriage of wheat to the English markets. Hon. John Haggart, Minister of Railways, said that ocean-going vessels would not pass Montreal if the canal was deepened, and wheat would always be trans-shipped at Montreal. The policy of the government at present was to build the few links which remained uncompleted so as to make the whole canal system between Montreal and Lake Superior fourteen feet. Besides this, the cost was altogether too great for the government at present, since it would cost in all $140,000,000.

SYMINGTON'S STEAM ENGINE.

The London *Engineer* publishes for the first time a letter addressed from Edinburg in 1790 to James Watt by Robert Cullen, afterward Lord Cullen, which supplies a missing link in the history of steam navigation. The letter was written to interest Watt in experiments which for some time past (or since 1788) have been carried on here for the improvement of naval architecture by "my particular friend, Mr. Miller, of Daldwinton, now deputy governor of the Bank of Scotland. Cullen thus proceeded:

"After having carried his experiments a great length and at a very great expense, for moving double and triple vessels by means of wheels, it occurred to him that putting these wheels in motion by means of steam, might prove a great improvement of his system. As, however, he had never particularly studied the steam engine, and imagined that his wheels might be moved to advantage by any steam engine, so by means of a Mr. Taylor, living in his family as tutor to his sons, he was induced to employ the steam engine of Mr. Symington, who resides at Leadhills and of whom you probably have heard.

"Mr. Miller, in consequence of the acquaintance formed in this way with Mr. Symington, employed him lately to erect two steam engines, the first to move a small double vessel, and the second to move a double vessel of greater size. The last experiment although attended with a considerable degree of success, as the vessel was made to go nearly at the rate of seven miles in an hour, has still left Mr. Miller far from being satisfied. He says that a great deal of the power of Symington's engine is lost in friction, and from having observed the operation of your engine at Mr. Whitbread's brewery, in London, I find he is strongly disposed to think that it is much better adapted to the purpose of moving his water wheels than Symington's can ever be brought to be.

"Mr. Miller is convinced that great advantages may be derived not only to the public, but to the persons who shall first put in practice under the protection of a patent, the moving of vessels by his wheels and the steam engine, and from the opinion he has formed of you and Mr. Boulton, I perceive he would incline to be connected with you in such a business, if you are equally disposed to it."

The reply of Watt was unfavorable. Otherwise, as the *Engineer* remarks: "Steam navigation would have been an accomplished fact many years before it was actually introduced with practical success."

HOOKING ON SKY TACKLES.

A Concord, Minn., editor does not think it is necessary to dig any more deep water canals. In explaining his scheme, which he maintains will revolutionize canals, he desires to buoy up vessels with air cylinders and his type of construction is a boat constructed with a flat bottom on which there is a combination of revolving cylinders with air tight cells.

This boat, he claims, can be built of any tonnage and run on canals without the necessity of locks, and can also be shot up and down rapids in rivers. Just so!

DEPTHS OF WATER AT HARBORS ON WEST SHORE OF LAKE MICHIGAN.

According to the official report of Major James F. Gregory, Corps of Engineers, U. S. Army, in charge of the district, the following were governing actual depths at harbors on the west shore of Lake Michigan, at dates specified:

Waukegan, April 13, 1894: The entrance channel with a least width of 80 feet, has a depth of 10 4-10 feet. The basin has a depth of from 9 to 11 feet.

Kenosha, April 5, 1894: A narrow and tortuous channel about 13 feet deep. A bar at the entrance with a minimum depth of 12½ feet extends from the south pier to within about 60 feet of the north pier.

Racine: Dredging is to be begun April 30th to make a channel 60 feet wide and 15½ feet deep. March 29-30, 1894: A narrow and tortuous channel about 13 feet deep. A bar at the entrance with a minimum depth of 12 feet extends from the south pier to about 80 feet of the north pier.

Milwaukee, March 16, 1894: About 16½ feet.

Port Washington, March 23-26, 1894: About 10½ feet.

Sheboygan, March 27-28, 1894: About 15 6-10 feet.

Manitowoc, April 1, 1894: About 14 feet.

Two Rivers, April 5, 1894: About 10 6-10 feet.

Kewaunee, April 11-12, 1894: About 13 6-10 feet.

Ahnapee, April 14-16, 1894: About 10½ feet.

Sturgeon Bay, harbor, April 13, 1894: About 13 feet.

Sturgeon Bay, canal, April 14-16, 1894: About 13 feet.

Green Bay, January, 1894: About 14 feet.

Oconto, April 25, 1894: About 6½ feet.

Menominee river and harbor, January, 1894: about 16 feet.

Cedar river, April 20, 1894: About 13 feet.

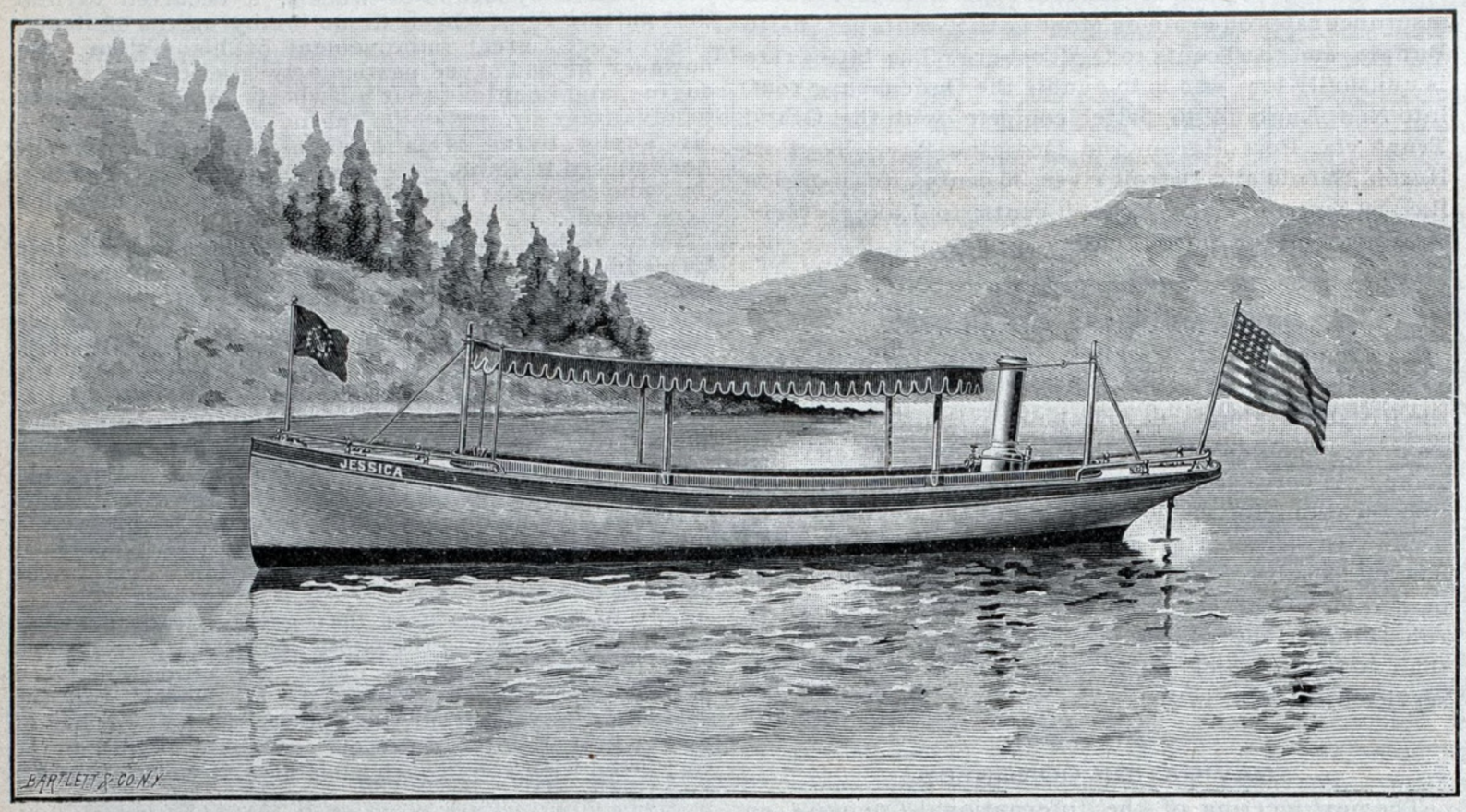
NEVER before has flour been carried from Duluth to Europe as cheaply as now. It costs but 44 cents to ship a barrel of flour from Duluth to Liverpool to-day. Of this, the lake and rail lines between Duluth and New-York get 25 cents and the ocean steamers 19 cents.

MOTOR AND AUXILIARY YACHTS.

ILLUSTRATED.

During the past few years yachts using naphtha and electricity as a fueling power have become in a measure quite popular, one firm alone having built nearly fifteen hundred of these superior craft and they still find an increasing demand for the special tonnage.

The handsome pleasure yachts and launches using naphtha for fuel were formerly regarded as being rather delicate to handle, if not positively dangerous, as of course any class of craft would be in the hands of careless people, however, the men who in the past looked somewhat askance at the clean, trim naphtha using boats,



25 FEET, 4 H. P. MOTOR LAUNCH.

are now among their strongest advocates and supporters.

The firm which has most prominently went forward with the manufacture of naphtha, electric and steam yachts and launches in the United States, is the Gas Engine & Power Co., of Morris Heights, New York City. Notwithstanding that two or three bills have been introduced in Congress to compel the former vessels to undergo government inspection so as to be forced to carry licensed engineers and pilots. The proposed legislation was considered totally unnecessary owing to the extreme simplicity of the motors in use on naphtha launches and its ease of management so that after several year's experience the safety of the craft using naphtha as a fueling power of propulsion has been clearly proved and exemplified in all parts of the world. This too, when steam vessels undergoing rigid annual inspections and carrying duly licensed officers were continually getting into minor troubles with their machinery, therefore, the crucial test of years of experience has demonstrated the safety of the principles embodied in the naphtha motor as a propelling power for a handy class of either business or pleasure craft.

The uses for small launches are innumerable, yet with engines run by gas, oil or steam there were conditions which prevented their general use, such as disagreeable noise, heat and being offensive to the smell, besides the trouble and inconvenience of using coal in a small craft, and obtaining certificated officers to run them, etc. These features the Gas Engine & Power Co. have eminently overcome and they have placed within the reach of any man having a little leisure and means the chance of running a neat little bit of machinery himself, such as is fitted in their naphtha launches of various sizes. Furthermore, in order to establish confidence in the use of their boats, the Gas Engine & Power Co. offer the free use of a launch to demonstrate the applicability and safety of the principle of expanding naphtha for power and using the same vapor, in part, for fuel.

The various government departments for work in connection with the coast and geodetic surveys, river and harbor, marine hospital, light-house and quarantine service as well as light towing, oyster dredging, etc., for private parties now vouch for the reliability of naphtha launches, but the manufacturers seem to have gone a step further and placed on the market an auxiliary as shown in cut No. 2. For those desiring to handle canvas during an extended cruise or with favorable slants of wind, or again from motives of economy and the combined power, the auxiliary is without doubt a feature to be appreciated, especially so in having so handy a rig as the jib mainsail and jigger shown in the accompanying cut.

The Dominion government cutter Petrel will take the place of the steamer Dolphin in watching the Canadian fishing ground on Lake Erie, for the purpose of seizing poachers.

A RECOVERED HULL.

The steamer Ogemaw was sunk in Green Bay December 3rd, 1891, about 1½ miles west of Burnt Bluff, Big Bay de Noc, in eleven fathoms of water. The rush of water as she foundered had such force that the crews of her consorts reported the compressed air as throwing her cabins and their contents 100 feet high.

The Ogemaw was built in 1881, at St. Clair, by Simon Langell, and was owned by Edward Smith, of Buffalo, and Capt. P. Pringle. She was a wooden steamer rating A 1½, and valued by the Lloyds at $37,000. The wreck of the Ogemaw rested quietly on the bottom of Green Bay two years, and was then raised by the Michigan Wrecking & Salvage Co. and towed to Detroit, where her machinery was taken out and put in perfect order. She is now having new upper works built and in a short time will be registered as a lake freight steamer.

INSURANCE CO. VS. F. & P. M. R. R. CO.

Judge Swan, in the United States court, has just directed the jury to find a verdict of no cause of action in the suit of the Flint & Pere Marquette Railroad Co. against the Marine Insurance Co., of London, to collect insurance for the partial loss of the railroad company's steamer, known as No. 2, by running on a shoal off Long Point, Lake Erie, on the morning of November 19th, 1892.

The steamer was chartered by Capt. Eber Ward, of Detroit, in the fall of '92 to carry freight between Duluth and Ogdensburg. Several hours before daylight on the morning of November 19th a heavy snow storm set in. The steamer went a few points out of her course, and the captain, thinking she was dangerously near shallow water, began to sheer out, but in a few minutes he was on the shoal. A portion of the cargo had to be jettisoned, and it was three days before four tugs could release her. Eight companies had risks on her. The railroad company claimed $20,000. Three of the companies paid their pro rata of the damages, and the other five refused. Suits were commenced against these five. It was stipulated that the other four should go as the first one was decided. The trial of the fifth, which was the one in which a verdict was directed to-day, was begun a week ago. The railroad company finished presenting its testimony this morning. The motion to direct a verdict was then argued, and Judge Swan granted it upon the ground that the rudder stock of the steamer was defective, and also because the crew was too small and a reliable lookout was not kept during the storm in which the accident occurred.

The case will be taken to the Court of Appeals.

THE LAST SLAVER.

The *Century* for May will have a story of the capture of the slave ship Cora, the last slaver taken by the United States, from the pen of Major Wilburn Hall, who was her prize captain. Major Hall, who is now the American consul at Nice, was a lieutenant on the Constellation, which chased and captured the Cora, and although he was a mere boy of twenty-one years, he was placed in charge of her, with her villainous crew and her cargo of 720 slaves. His voyage was an eventful one, as he had not only the elements to contend with, but sickness among the crew and an incipient mutiny. When he landed with his prize in New York and learned of the outbreak of the Rebellion, he threw up his commission and cast his lot with the Confederacy. At the end of the war he took service under the Khedive of Egypt. The captain of the slaver escaped from the Constellation, to which he was transferred at Sierre Leone. Years afterward Major Hall met him, a painted, spangled clown in a circus, the celebrated William B. Donaldson.

MARINE PATENTS.

The following list of patents of interest to marine people have been filed at Washington:

517,155. Sailing-vessel—John M. Boorman, Hempstead, N. Y. Filed Aug. 1, 1893.

515,772. Steam steering apparatus—Cyrus H. Hawkins, Brooklyn, N. Y. Filed July 13, 1893.

518,830. Paddle propeller—Andrew Beers, Dansville, Mich. Filed Dec. 1, 1893.

517,999. Oar—Arthur H. Burns, Penn Yan, N. Y. Filed Oct. 21, 1893.

517,462, Ship's berth—Edward Lawson, Birmingham, England. Filed Feb. 9, 1893.

518,072. Boat-propeller—Frank P. McElfresh, Kimbalton, Iowa. Filed July 17, 1893.

517,068. Sheet-shackle—Frank Robinson, Gloucester, Mass. Filed Jan. 31, 1893.

518,677. Boat-knee—Adoniram J. Nickerson, Argyle, Canada. Filed Sept. 26, 1893.

517,864. Lee-wing for vessels—Nathan C. Jessup, West Hampton Beach, N. Y. Filed June 17, 1893.

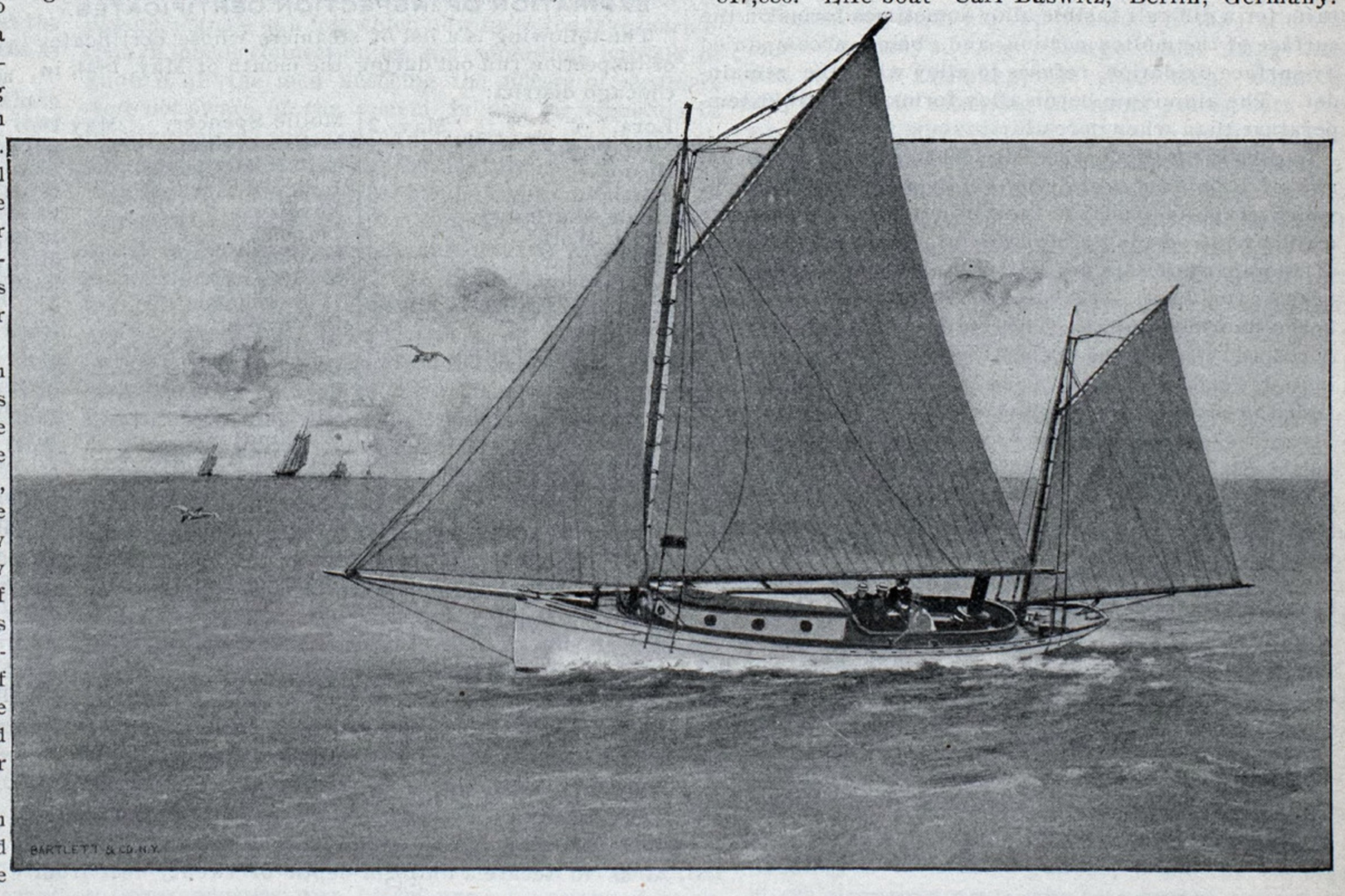
517,536. Life-boat—Carl Baswitz, Berlin, Germany. Filed June 17, 1893. Patented in Germany Sept. 24, 1892 and in England Nov. 24, 1892.

518,605. Oar-propeller for boats—Horace Hurlburt, Leavenworth, Kansas. Filed Sept. 3, 1892. Renewed March 19, 1894.

517,029. Apparatus for determining, correcting, or compensating compass deviations—Carl T. E. Clausen, Copenhagen, Denmark. Filed May 17, 1893.

517,193. Sail for vessels—Thomas W. Ratsey, Cowes, assignor of two-thirds to Edwin Lapthorn, George Rogers Ratsey, and Edwin Walter Lapthorn, Gosport, England. Filed March 20, 1893.

518,028. Vessel and propelling mechanism therefor—Rufus Folsom, Chelsea, assignor of one-half to George A. Folsom, Boston, Mass. Filed Dec. 29, 1892.



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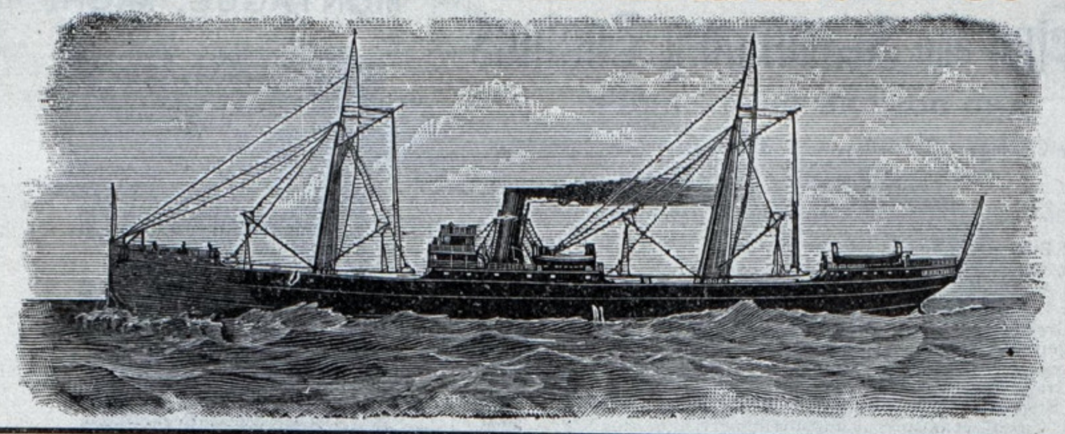

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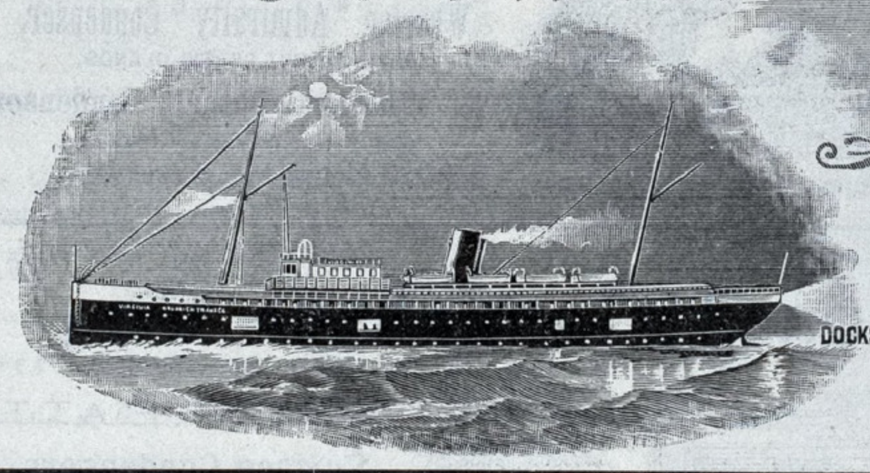

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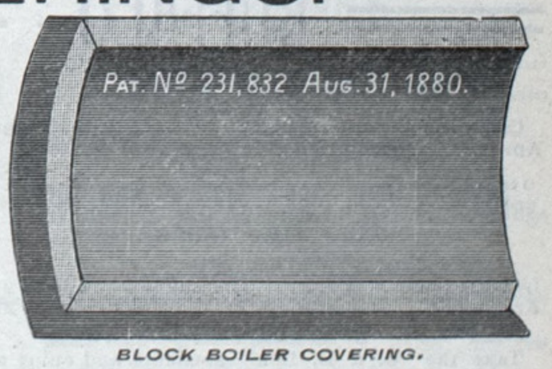

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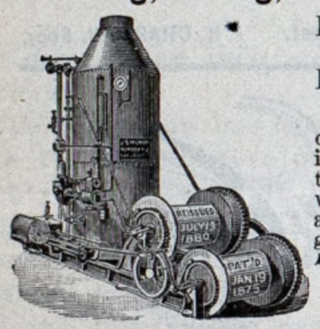

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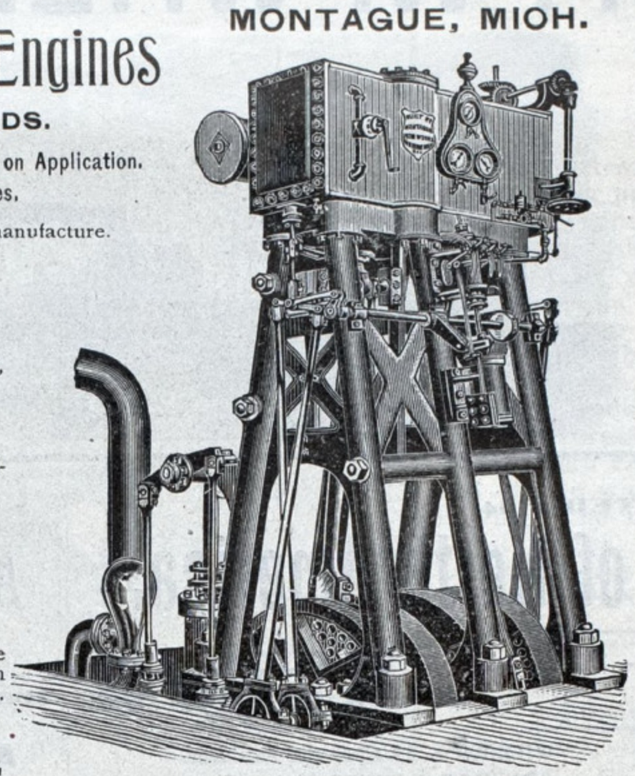

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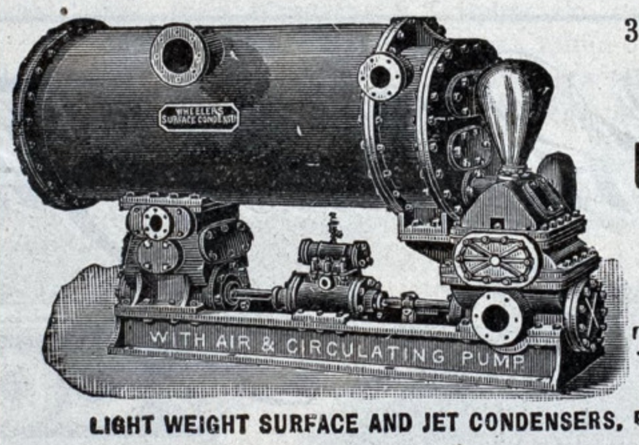

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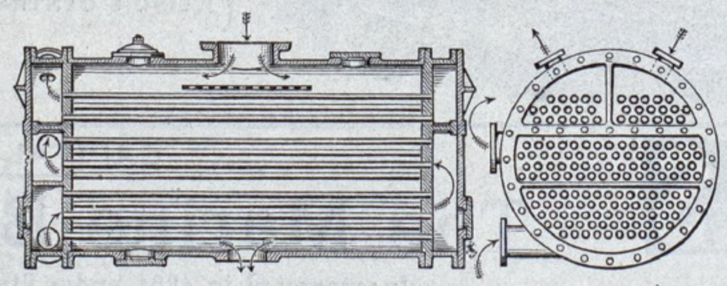

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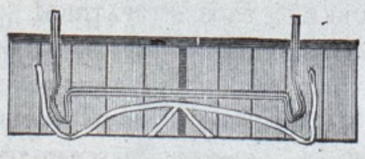

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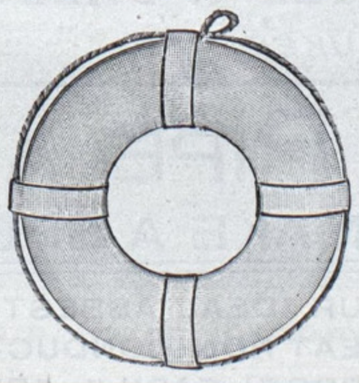

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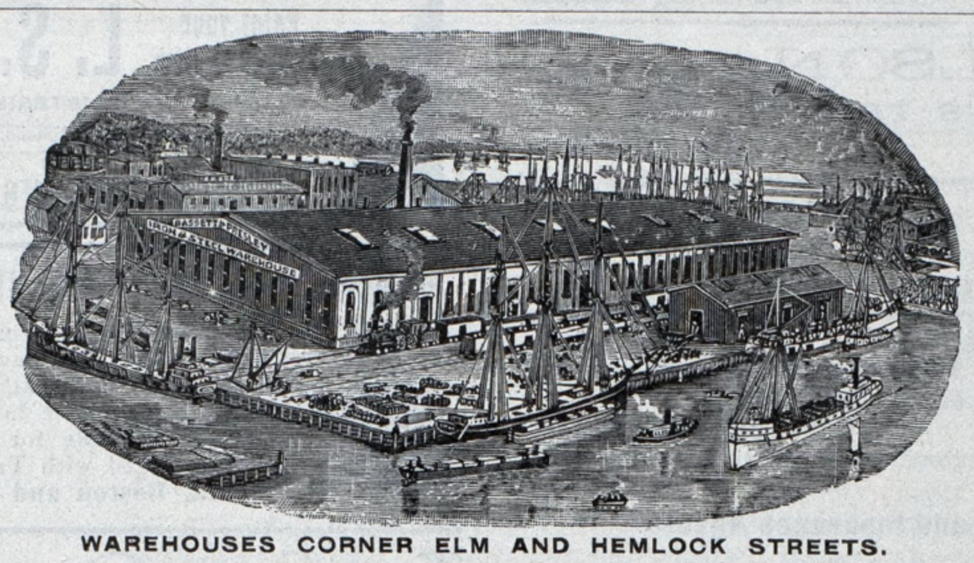

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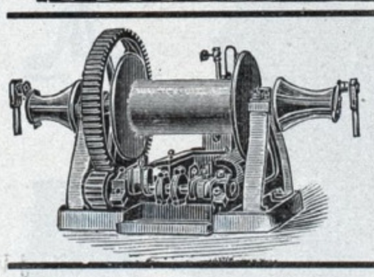

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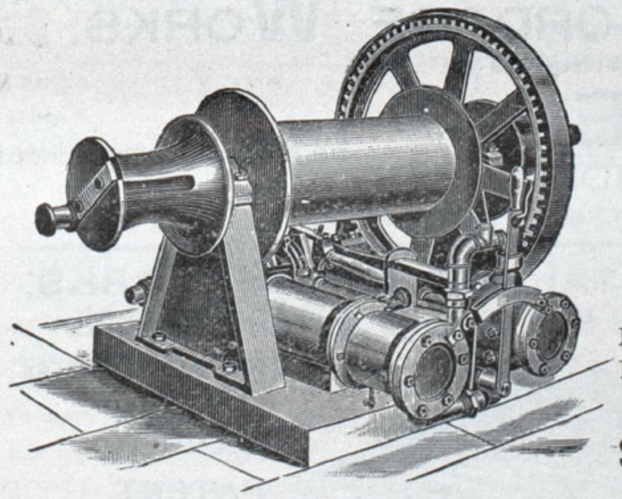

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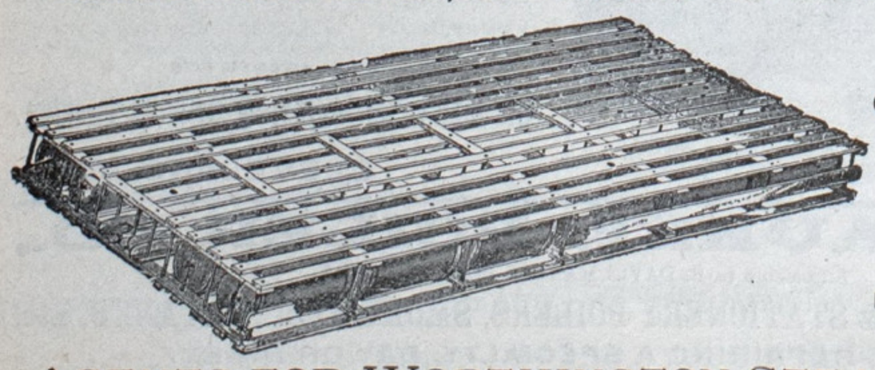

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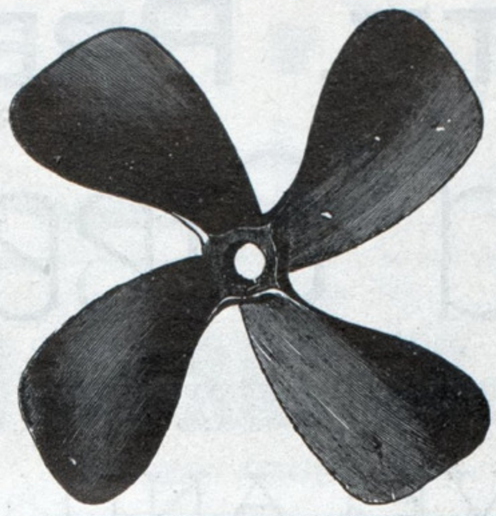

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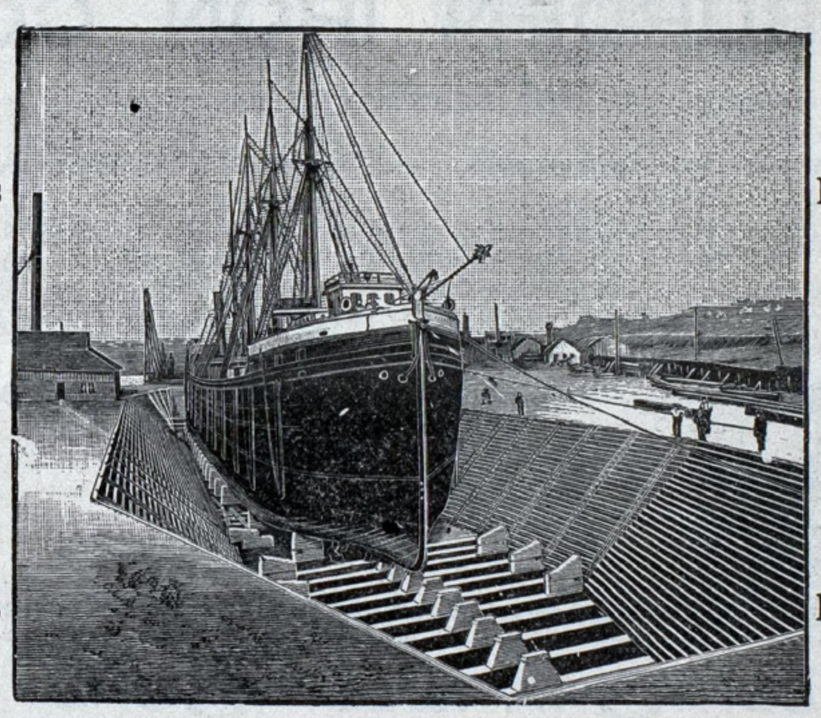

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